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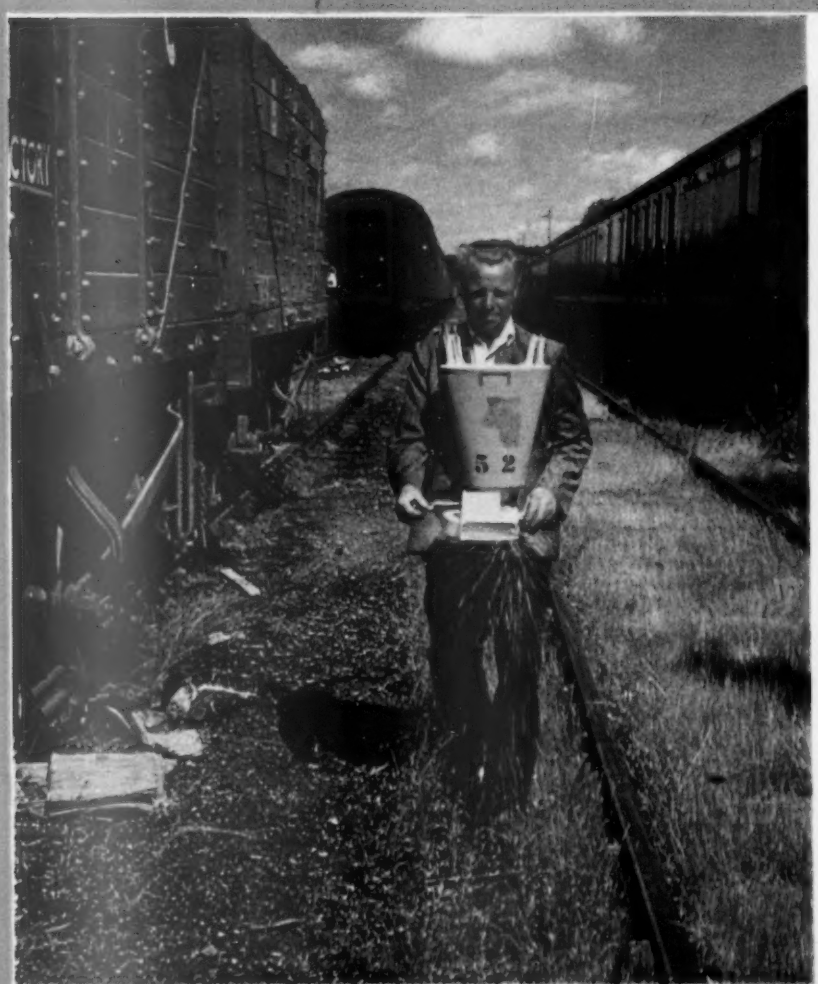

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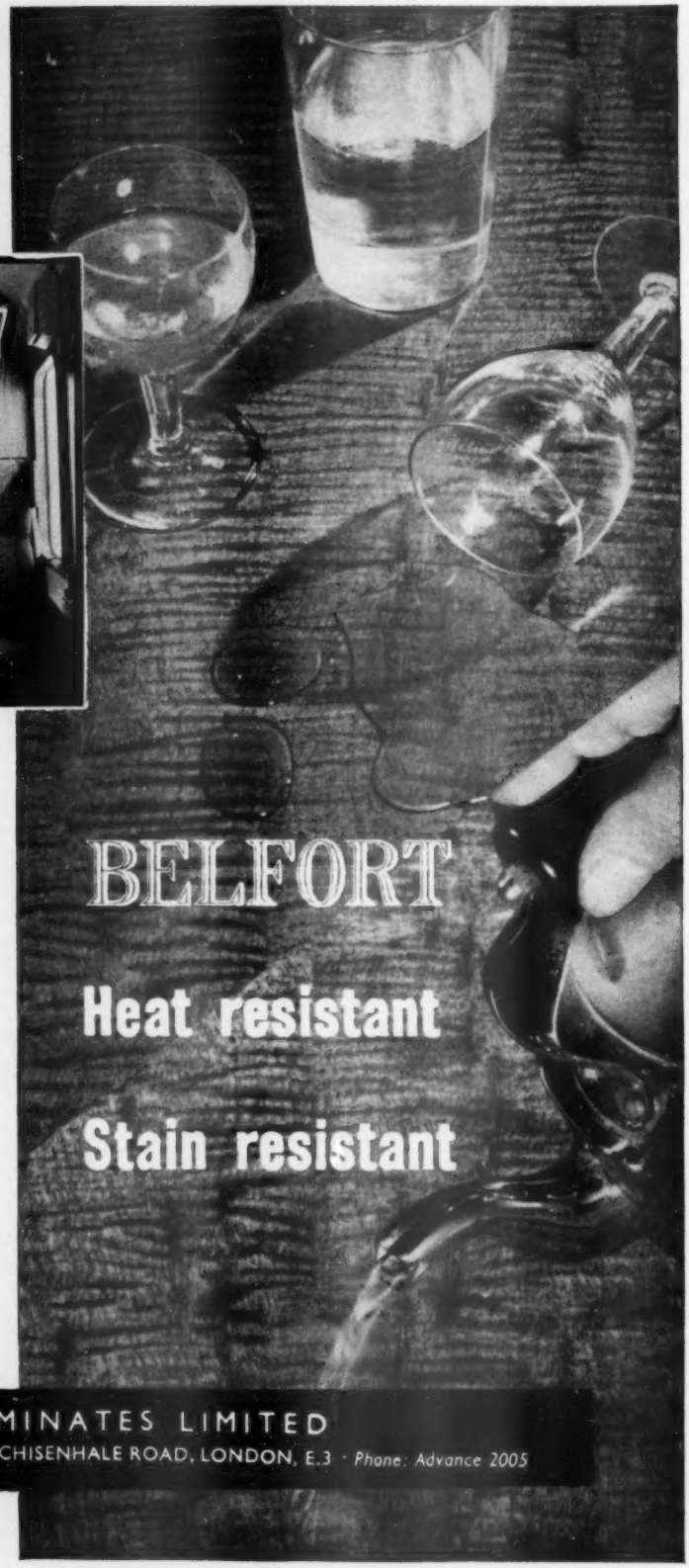

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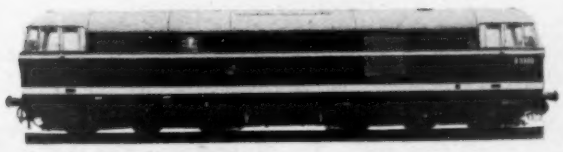

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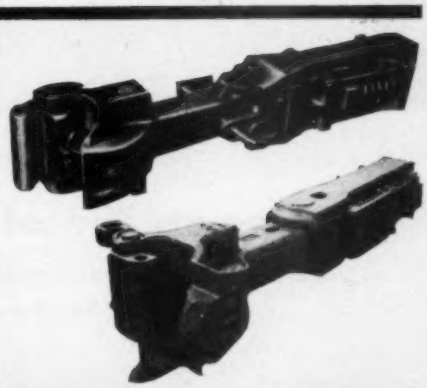

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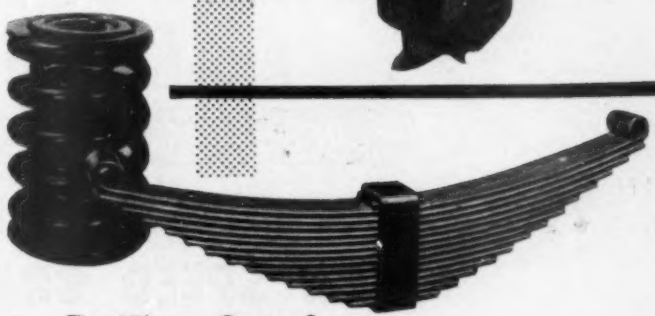

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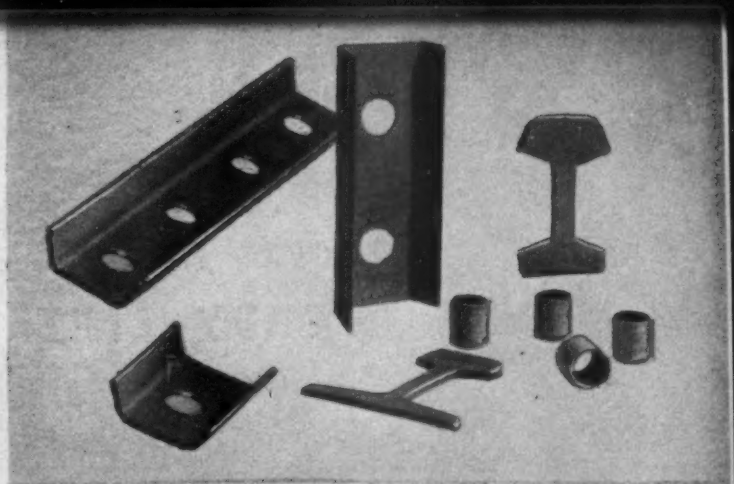

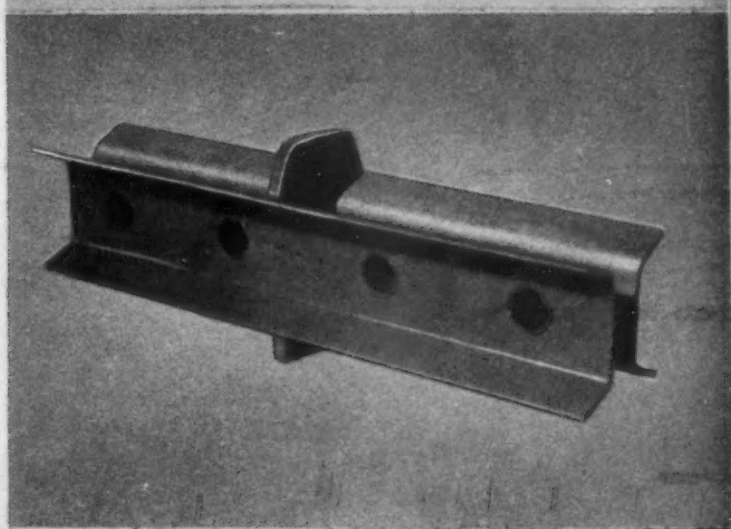

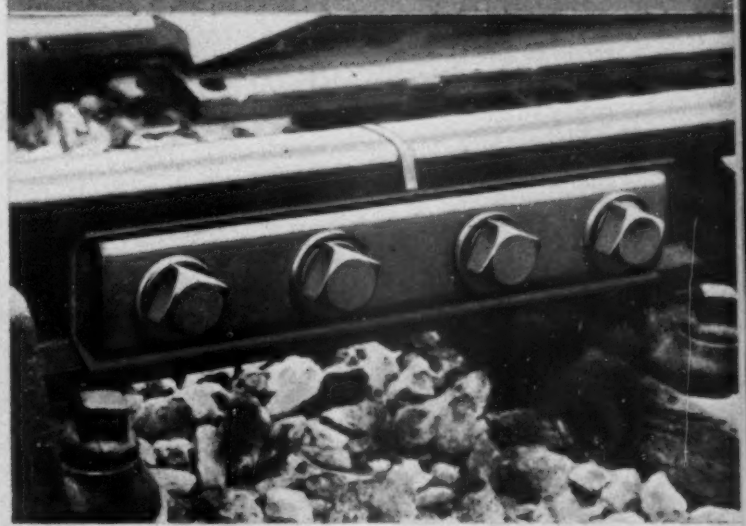

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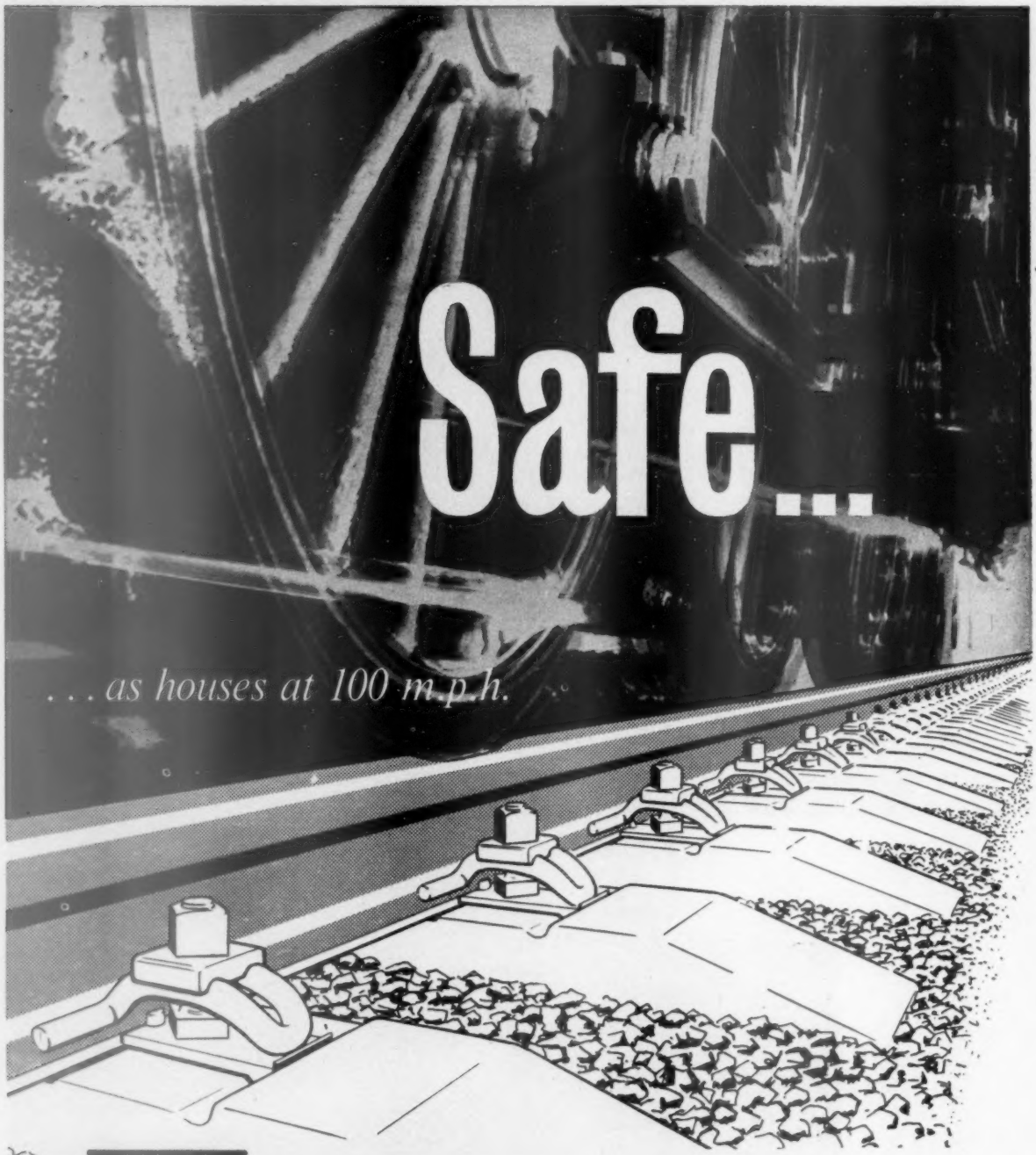

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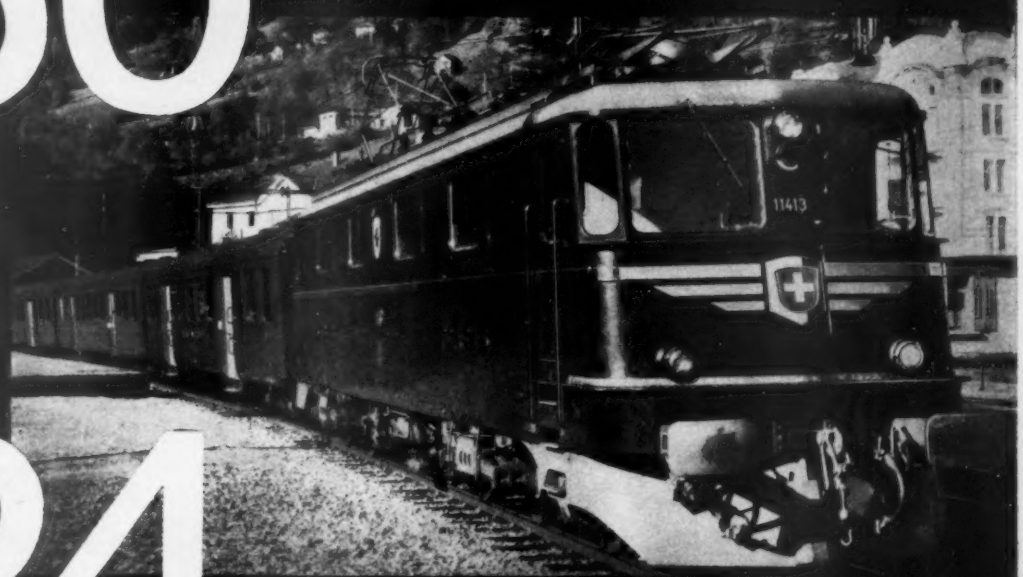

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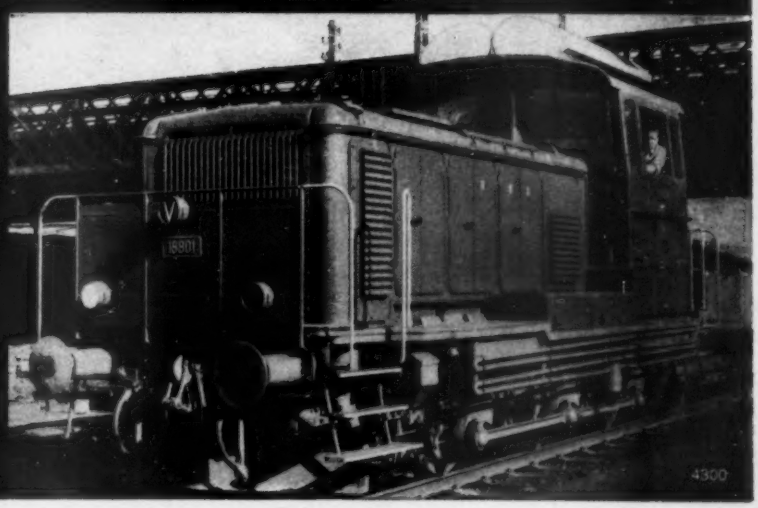

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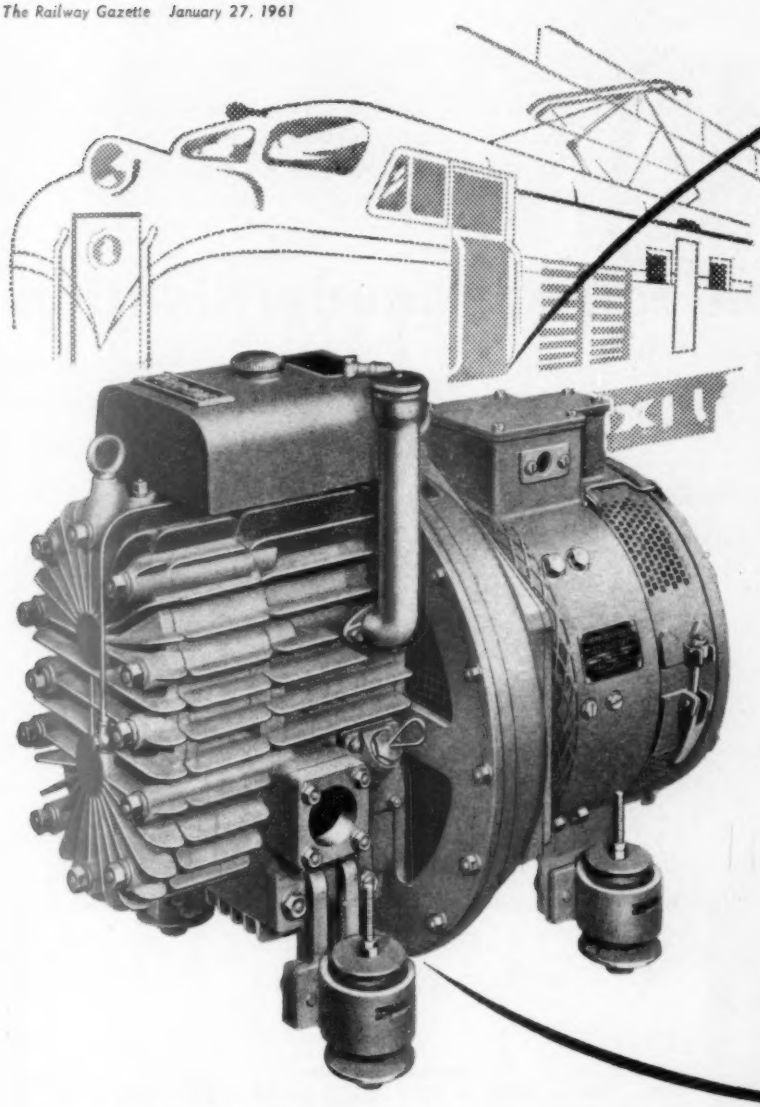

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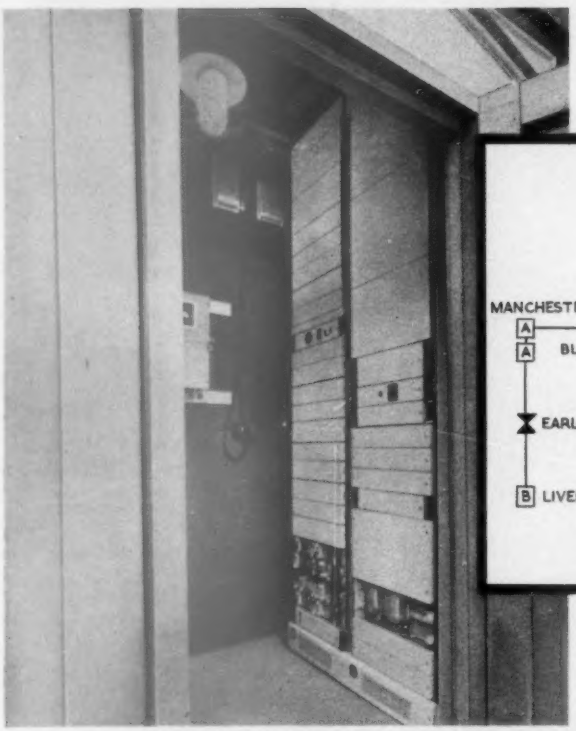

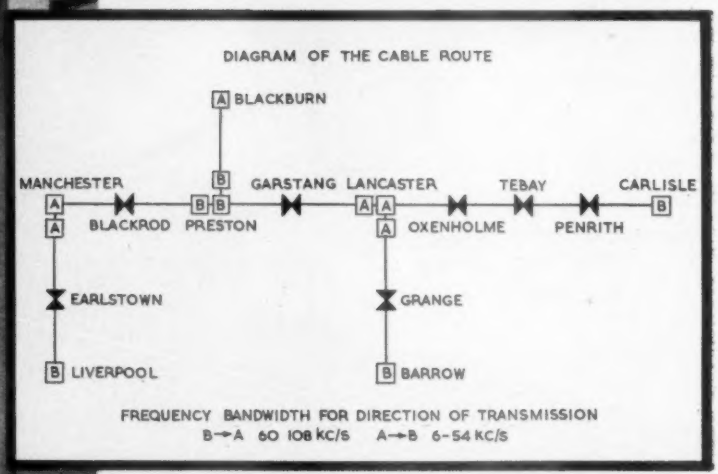

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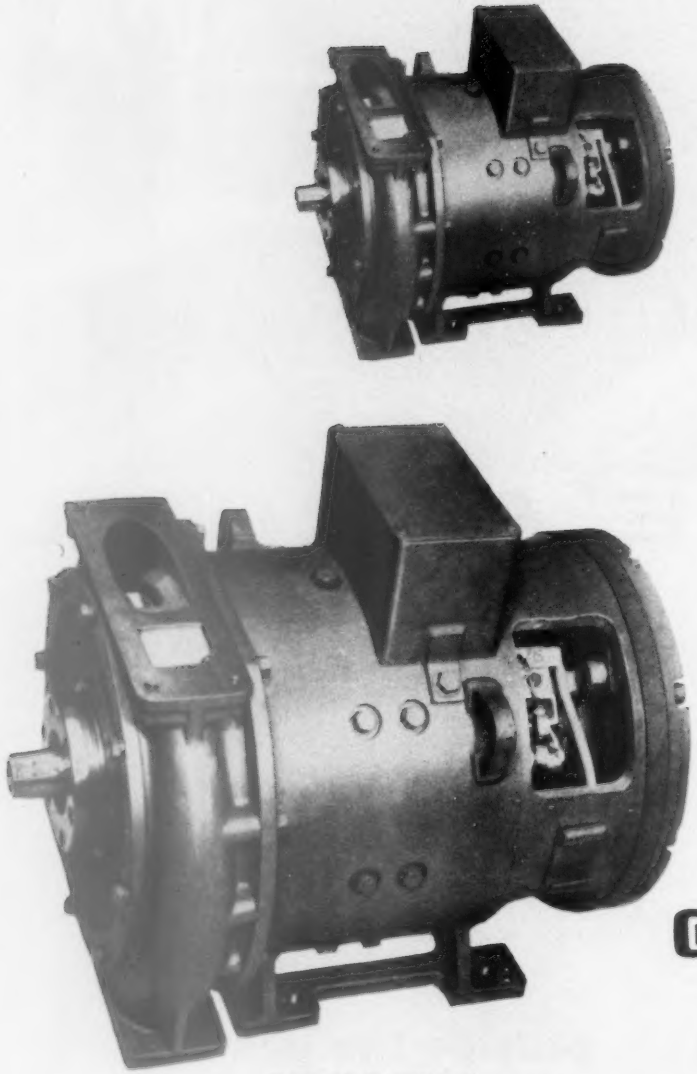

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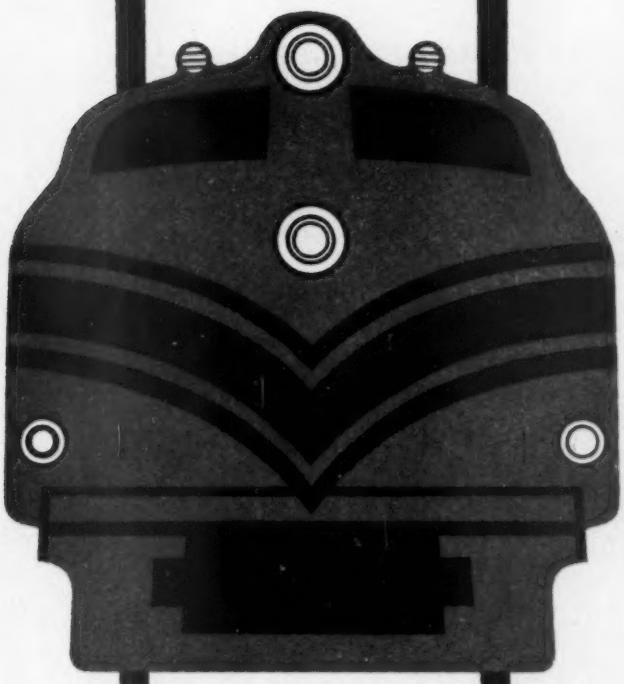

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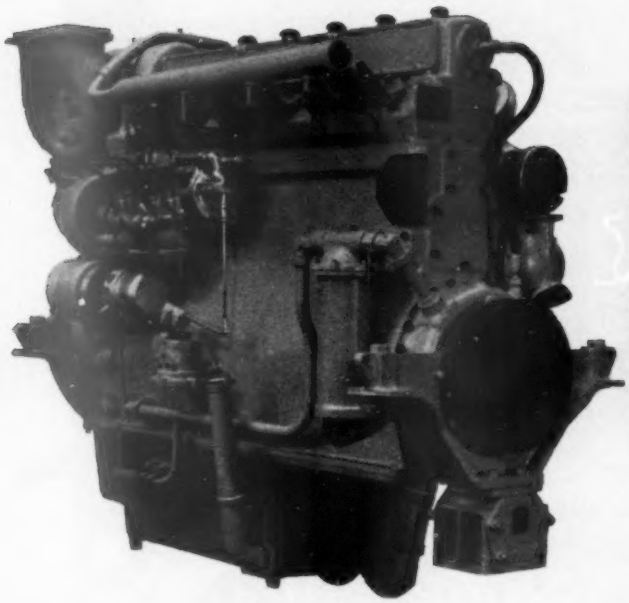

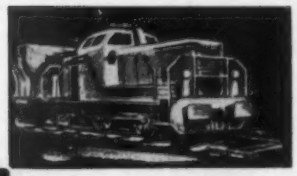

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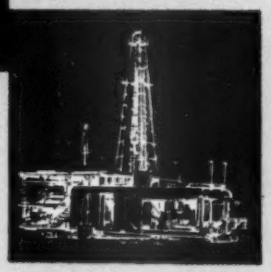

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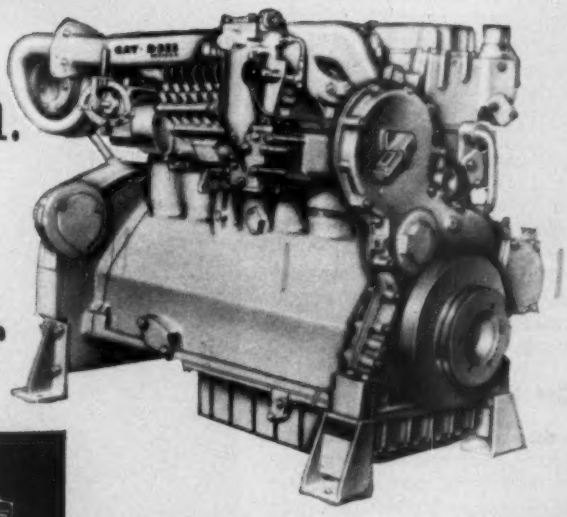

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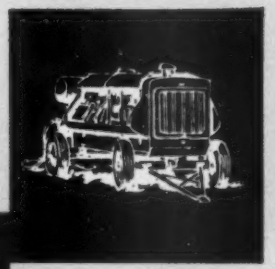

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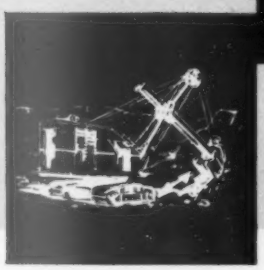

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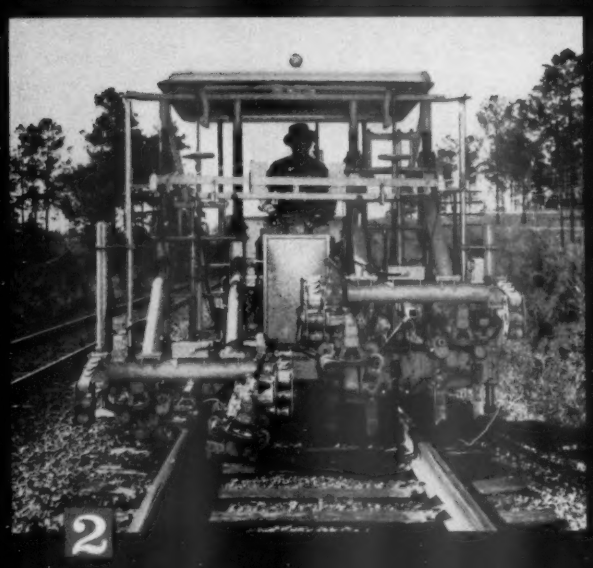
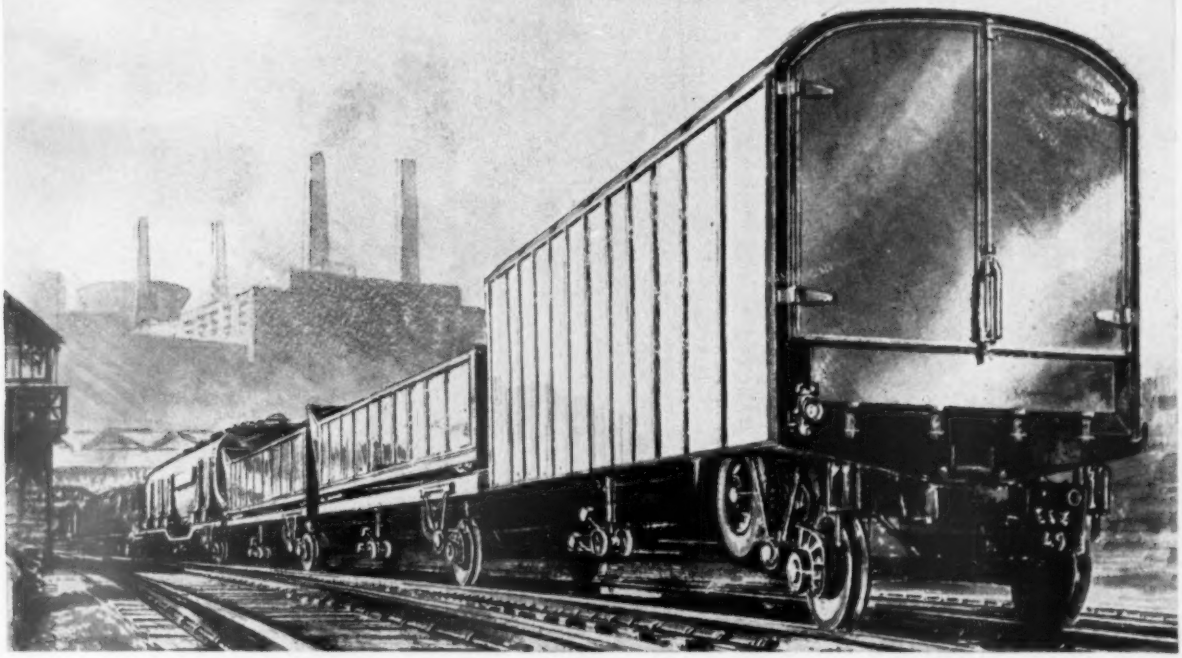
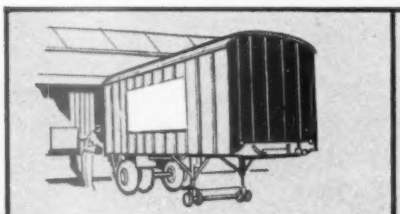


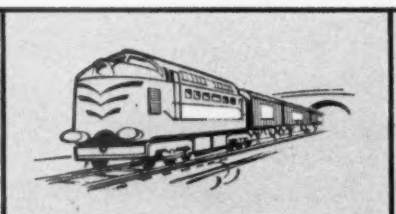
Now–the ROADRAILER



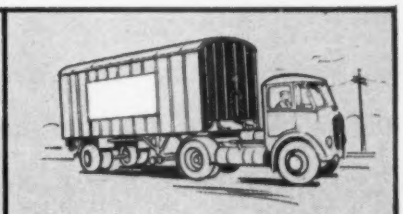
...speed and economy on trunk hauls and door-to-door service too!



1 The Roadrailer, loaded at the factory as an ordinary articulated lorry.



2 The Roadrailer as part of a fast freight train.



3 The Roadrailer converted back to a lorry completes delivery by road.

Now it's an 11-ton lorry, loaded in the usual way and driven by road to the railhead. Only 150 seconds to retract the road wheels and lower the rail wheels and hey presto – now it's part of a fast freight train designed for through travel at an average speed of 60-65 m.p.h.

The Roadrailer brings your railhead to your customer's factory. It brings the best of both worlds, giving traders the economy and uncluttered speed of long-distance rail haulage *plus* the convenience of door-to-door collection and delivery. It can be adapted for liquids, timber, cement – all kinds of traffic.

The introduction of the Roadrailer is in *any* country's interest: it frees the roads, puts trunk haulage on the railway where it sensibly and economically belongs, and helps industry by making transport cheaper and faster.

150 SECONDS — YOU CAN HAVE THE BEST OF BOTH WORLDS

PS

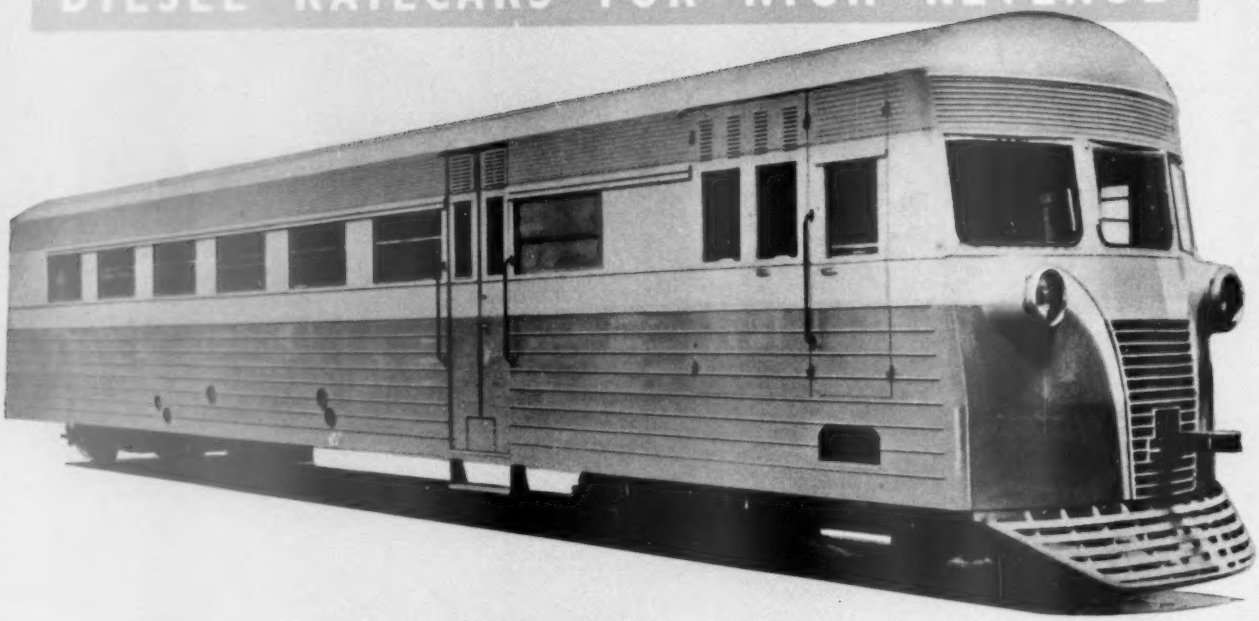
PRESSED STEEL CO LTD

Railway Division,
Linwood Factory, Paisley, Scotland

LONDON OFFICE: Railway Division, 47 Victoria Street, London, SW1. HEAD OFFICE: Cowley, Oxford. BRUSSELS OFFICE: Cantersteen 7, Galerie Ravenstein 30, Brussels 1, Belgium. Manufacturers of motor car bodies, Prestcold refrigeration equipment and pressings of all kinds.

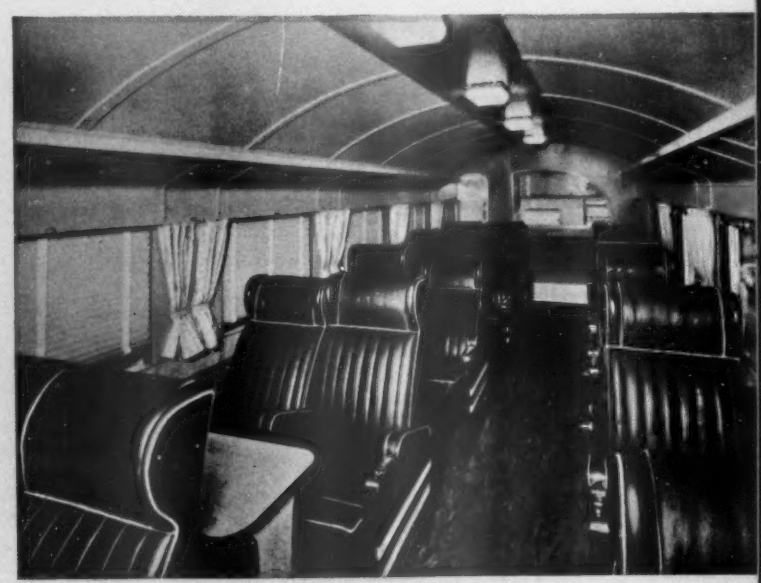
WICKHAM OF WARE

DIESEL RAILCARS FOR HIGH REVENUE



For reliable service adequate power-weight ratio is essential. The Wickham steel tubular stressed frame construction offers a very favourable payload-tare ratio with moderate power. Illustrated is a double-bogie type with adjustable and rotatable seating, buffet, electric cooker, refrigerator, ample baggage space, lavatory and separate driver's cabin. Tare weight is only 15 tons 2 cwt. (15,350 kilos).

WICKHAM PRODUCTS:
DIESEL RAILCARS, LIGHTWEIGHT RAILBUSES, INSPECTION CARS, TOWER TROLLEYS, GANG CARS, PUMP TROLLEYS, TRACK EQUIPMENT.



D. WICKHAM & COMPANY LIMITED
WARE, HERTFORDSHIRE, ENGLAND

Telephones: WARE 394-6
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Photograph: courtesy of the Royal Geographical Society

When they are threatened by monsoon squalls, the fishermen of Trincomalee can hasten to shelter behind a staunch harbour wall built in the last century. DOCKERS' PAINTS have given sound protection to rolling stock, vehicles, and buildings on the transport systems of the world for over 70 years.

HAVE YOU A PROBLEM OF PROTECTION?

Technicians at our Research Laboratories will advise you on any aspect of paint technology, including the choice and methods of application of DOCKERS' PAINTS.

Protection

DOCKERS' PAINTS

Tested by Time in every Country under the Sun

Docker Brothers · Ladywood · Birmingham 16 · England
Makers of Paints, Lacquers and Varnishes for Every Purpose

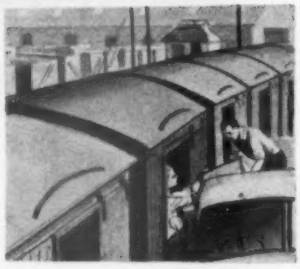
INSIDE OUTSIDE

. . . there's a THOMSON PRODUCT to suit the job

"Alhambrinal" is the modern, permanent interior panelling and may be used for body or lining panels, bulkheads, ceiling panels and seat backs in railcars, carriages and public service vehicles.

The above photographs of Diesel Rail Cars with "Alhambrinal" panels are by courtesy of British Railways.

Double or single-prepared Waterproof Roofings for the outer roofs of Railway Carriages and covered Goods Vans. Also Tarpaulins for open Wagons.



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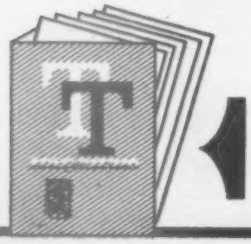
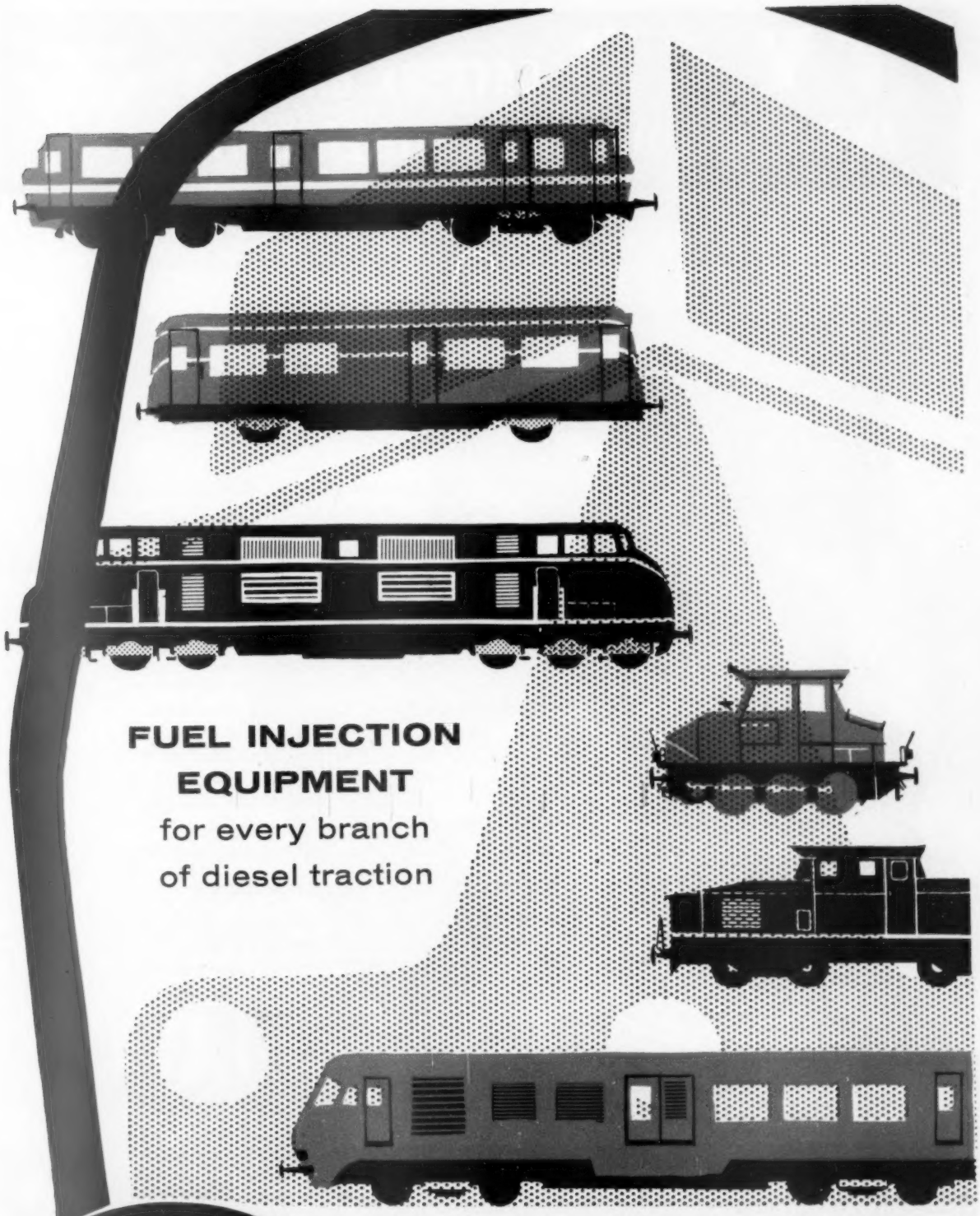
SONS & CO. (BARRHEAD) LTD.
FERENEZE WORKS,
BARRHEAD, Nr. GLASGOW



LITERATURE ON REQUEST. We will be glad to send you, without obligation, a booklet containing fuller details of the products mentioned in this advertisement. Samples of "Alhambrinal" and Roofings are also available.



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The World's Largest Manufacturers of

FUEL INJECTION EQUIPMENT

C.A.V. LIMITED ACTON LONDON W.3.

AP.111

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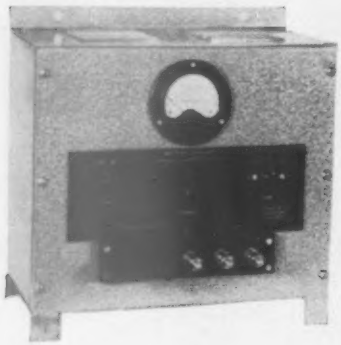
. . . built for conditions encountered on railway service throughout the world —in sizes to meet all requirements, and fully conforming to British standards.



BATTERY CHARGER UNITS

comprising a transformer of appropriate capacity and windings for the required voltage with tappings to suit line drop, as also for varying the charging current, and including a rectifier, on and off switch, tapping switch and variable resistor (coarse and fine) control.

TYPE P.9592/1: 200–250V A.C. for 6 LA cells charging at 1.75/5A.
Case size: 12″ x 12″ x 6″
TYPE P.9592/2: 100–110V A.C. for 30 Nife cells at 50 mA/3A
Case size: 12″ x 12″ x 9″
TYPE P.9591/1: 110V A.C. for 3 LA cells charging at .025/1A
Case size: 8¼″ x 5¼″ x 4⅛″
TYPE P.9591/2: 250V A.C. for 2 LA cells charging at .025/1A
Case size: 8¼″ x 5¼″ x 4⅛″

TYPICAL CHARGING UNITS/Input 200, 230, 250V A.C., 50 c/s
Charging 1 LA cell, max. current 1 amp., min. 50mA
„ 2 or 3 LA cells, max. current 1 amp., min. 25 mA
„ 6 LA cells, max. current 3, 5 or 8 amp, min. 50 or 1.75 mA
„ 8, 12, 16 or 20 LA cells, max. current 3 amp., min. 50 mA
„ 30 Nife cells, max. current 3 amp., min. 50 mA

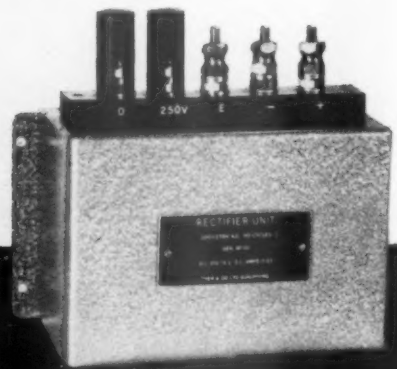
O.B.A. TERMINALS with or without shrouds
METAL CASES for wall or shelf mounting, hammer grey finish.

TRANSFORMER RECTIFIER UNITS

for feeding D.C. track circuits, relays and similar purposes. Of appropriate capacity and windings to suit the supply voltage with tappings to compensate for line drop and circuit adjustment.

Switches and Ammeters can be provided.
Typical Ratings

(1) P.9590/1: 250V A.C., 2 volts D.C. at 0.350 amps.
Case size: 8¼″ x 5¼″ x 4⅛″.
(11) P.9013/1: 110V A.C., 24 volts D.C. at ½″ and 1 amp., with d/w transformer and full wave bridge rectifier for feeding a resistance load.
Input 110V 50 c/s A.C.
Output 24V D.C. at 0.5 amps. with tappings at 23V and 25V.
Case size: 8¼″ x 5¼″ x 4″.



TYER & COMPANY LIMITED
RAILWAY SIGNAL AND TELEGRAPH ENGINEERS
(Established 1851)
PERRAM WORKS, MERROW SIDING, GUILDFORD, SURREY, ENGLAND
Telephone Guildford 2211. Cables Switchmen, Guildford.
(Within the Organisation of the Southern Areas Electric Corporation)

Interior of one of the 349 Electric Coaches built by Metropolitan-Cammell Carriage & Wagon Company Limited, England, for the Reef Suburban System, South African Railways and for which PEL supplied the seating.

The bones of the problem

In Pel's view, only the closest examination of the very bones of a seating problem can yield a correct and logical design.
To test the effectiveness of this approach travel by train in South Africa, Nyasaland, Malaya, New Zealand, Chile, Bolivia, Argentine, Sweden and Britain. For Pel's best catalogue is an international one of seats at work across hot, temperate and cold climates.
It is a telling catalogue of successes founded on skill in design, on experience in manufacture, on exact appreciation of the operator's requirements and, not least, on a concern that seating requirements are met, and matched with economic prices.

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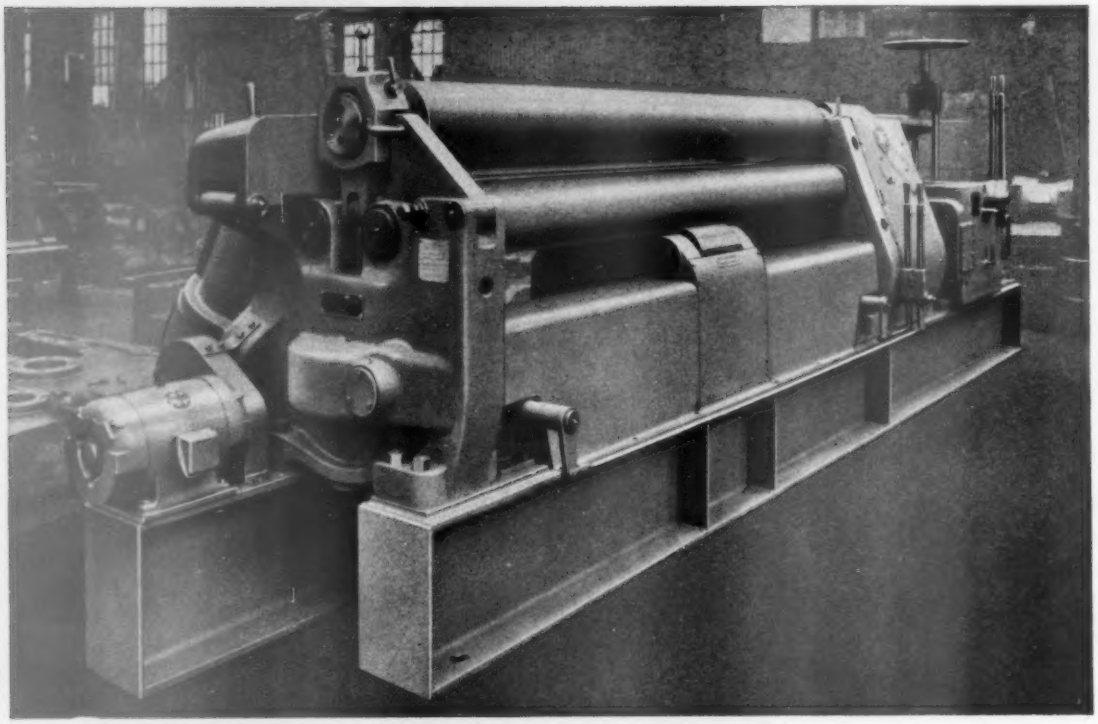

CLYDE BUILT SMT GLASGOW MACHINE TOOLS

COMBINED PLATE BENDING & STRAIGHTENING ROLLS

Our combined machines are similar in general construction to our well-known pyramid type Plate Bending Rolls, with the addition of a fourth roller for plate levelling purposes. A wide range of sizes is available: from ¼ in. to 1¾ in. plate thickness and 4 ft. to 14 ft. plate width.

All rollers are of forged steel with large diameter journals running in gunmetal liners. Long machines have support rollers for the bottom rollers to resist deflection and to enable the main bottom rollers to be as small in diameter as possible, allowing close bending centres to be used. On all our machines the bending centres are kept to a minimum to permit close and accurate work. Driving efficiency is also improved.

The housings are very substantial with generous bearing blocks. The end bearing of the bending roller turns down (by power on the larger machines) and particular care is taken to guide this bearing block against rolling thrusts in the working position. The top roller is supported at the opposite end and tubes can be withdrawn very easily.

The drive, except on the very largest machines, is by a pair of reversing coil clutches, giving a beautifully smooth and controlled action. Roller adjustment is through a pair of similar clutches. The very largest machines have reversing motor drive, the electrical controls of which, as well as the clutch levers of the smaller machines, are brought to the best position to give the operator an excellent view of the work.

SCOTTISH

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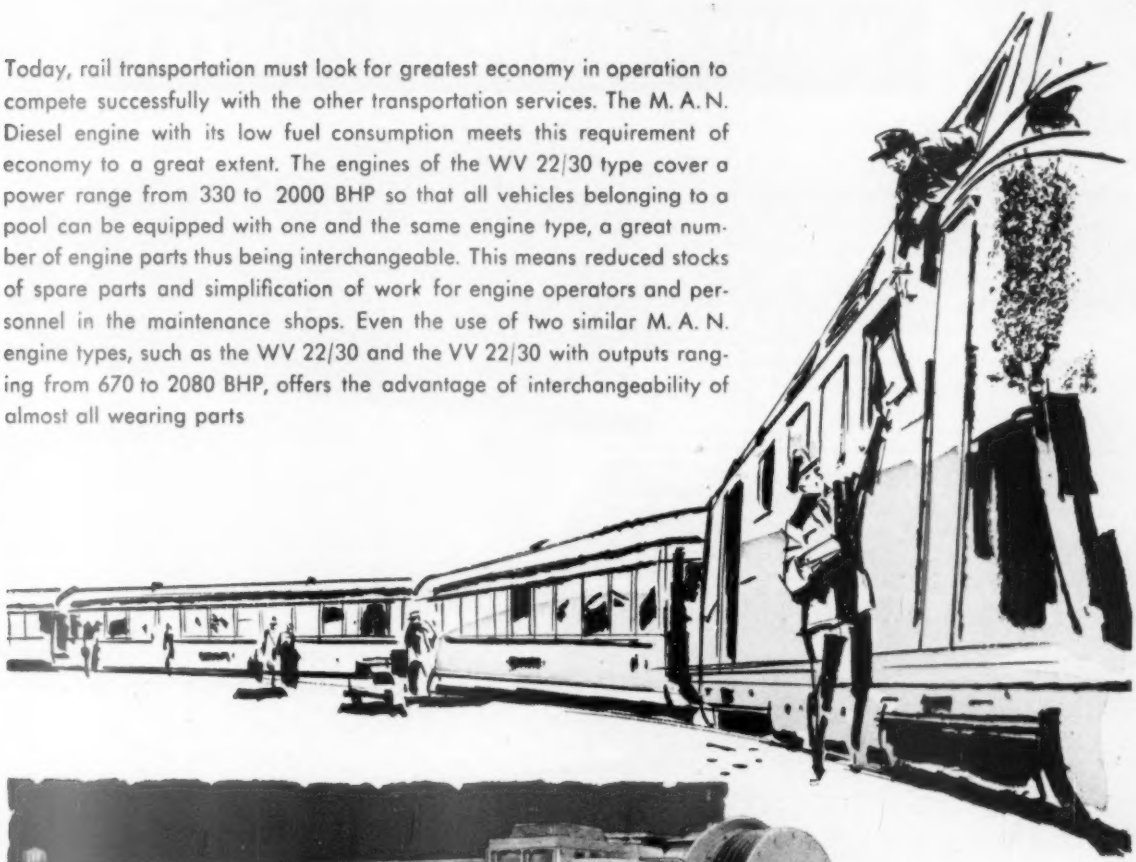
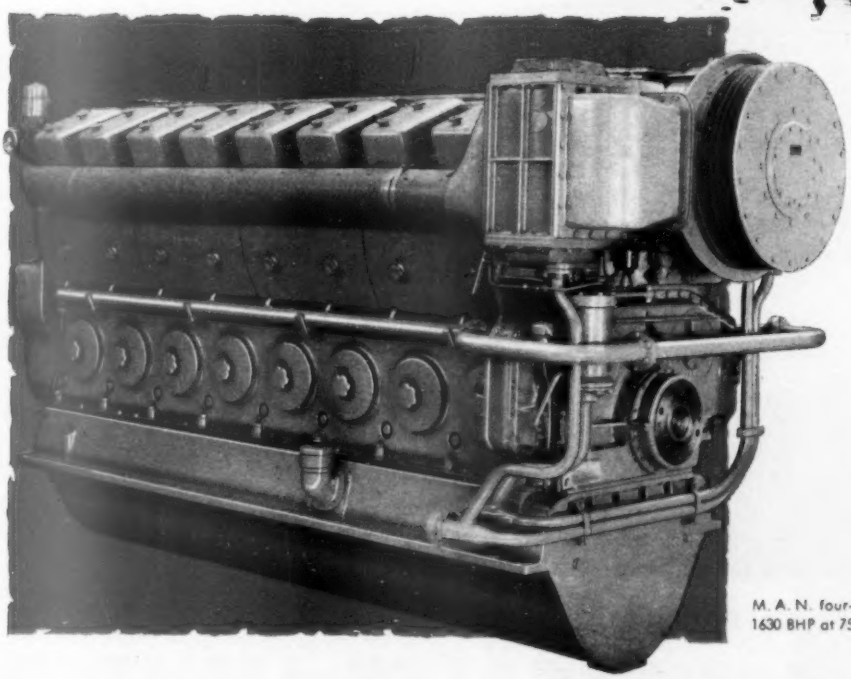
M·A·N -DIESELS FOR RAIL TRACTION

Today, rail transportation must look for greatest economy in operation to compete successfully with the other transportation services. The M. A. N. Diesel engine with its low fuel consumption meets this requirement of economy to a great extent. The engines of the WV 22/30 type cover a power range from 330 to 2000 BHP so that all vehicles belonging to a pool can be equipped with one and the same engine type, a great number of engine parts thus being interchangeable. This means reduced stocks of spare parts and simplification of work for engine operators and personnel in the maintenance shops. Even the use of two similar M. A. N. engine types, such as the WV 22/30 and the VV 22/30 with outputs ranging from 670 to 2080 BHP, offers the advantage of interchangeability of almost all wearing parts





M. A. N. four-stroke Diesel Engine type V 8 V 22/30, 1630 BHP at 750 r. p. m. or 2000 BHP at 950 r. p. m.

MASCHINENFABRIK AUGSBURG-NÜRNBERG AG · WERK AUGSBURG

METCALFE-OERLIKON

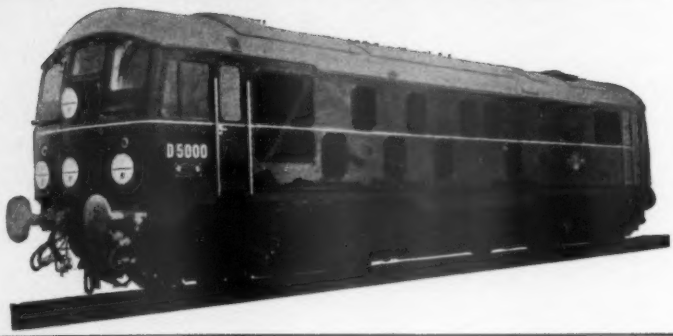
MODERN BRAKE EQUIPMENT

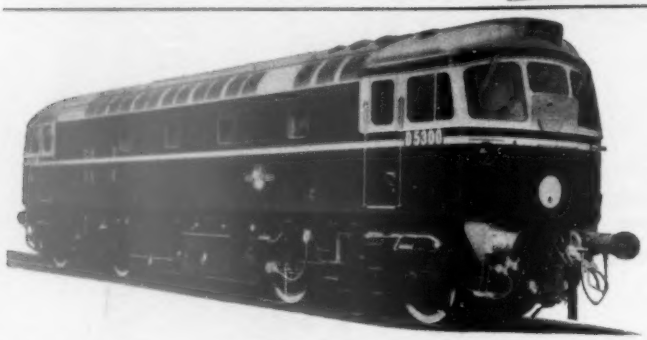
1160 H.P. Type '2' Diesel-Electric Locomotives.

Built by the Derby, Crewe and Darlington works of the B.T.C.

176 of these locomotives are to be supplied with Sulzer Engines and Power Equipment by A.E.I. Traction Division.

Metcalfe-Oerlikon brakes are also fitted.





1160 H.P. Type '2' Diesel-Electric Locomotives.

Built by the Birmingham Railway Company & Wagon Co. Limited.

47 of these locomotives have Sulzer Engines and Crompton Parkinson Power Equipment.

Metcalfe-Oerlikon brakes are also fitted.

1100 H.P. Type '2' Diesel-Electric Locomotives.

Built by the North British Locomotive Company Ltd.

They have N.B.L./M.A.N. Diesel Engines and General Electric Company Power Equipment.

Metcalfe-Oerlikon brakes are also fitted to 38 of these.

The above are just three of the many types of Main Line Diesel-Electric Locomotives now in service with British Railways and all are equipped with 'Metcalfe-Oerlikon' patent Vacuum Controlled Air Brake Equipment.

Undiminishing Performance
Light Weight
Friction Free Valves
Reduced Maintenance
Easy Installation

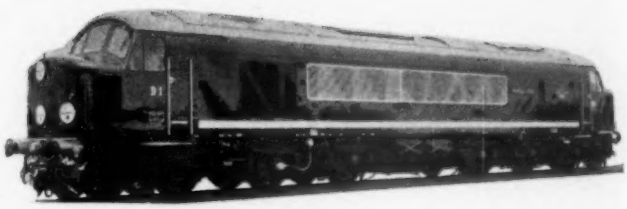
Suppliers to the World's Railways since 1870

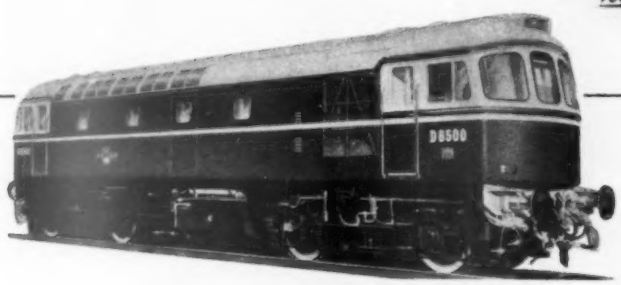
DAVIES & METCALFE LIMITED

METCALFE-OERLIKON

MODERN BRAKE EQUIPMENT

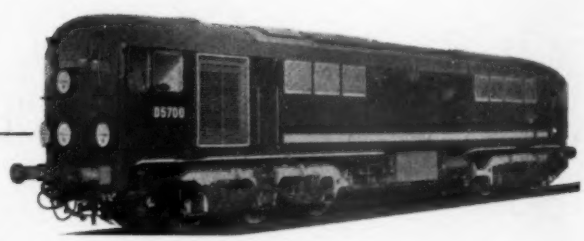
10 — 2300 H.P. Type '4' Diesel-Electric Locomotives. Built by the Derby Works of the B.T.C. and fitted with Sulzer Engines and Crompton Parkinson Electrical Equipment. 10 of these Locomotives are in service with British Railways and a further **137** are now building.

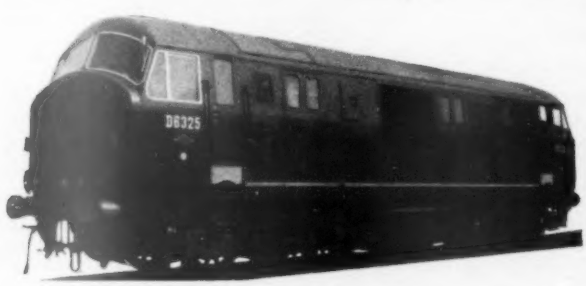




1550 H.P. Type '3' Diesel-Electric Locomotives. Built by the Birmingham Railway Carriage & Wagon Co., Ltd. and fitted with Sulzer Engines and Crompton Parkinson Electrical Equipment. **98** of these Locomotives are to be supplied, and these are arranged for working with either 'Vacuum' or 'Air' braked trains through a single Driver's Brake Valve.

20 — 1200 H.P. Type '2' Diesel-Electric Locomotives. Built by Associated Electrical Industries Ltd. and fitted with Crossley Brothers Ltd. engines. These Locomotives are now in service on British Railways.





52 — 1100 H.P. Type '2' Diesel-Hydraulic Locomotives being built by the North British Locomotive Co., Ltd. with N.B.L./M.A.N. Engines and Voith/North British Hydraulic Transmission.

THE ABOVE LOCOMOTIVES ARE EQUIPPED WITH METCALFE-OERLIKON BRAKE EQUIPMENT

JUST ANOTHER FOUR OF THE MANY TYPES OF MODERN MAIN LINE LOCOMOTIVES NOW IN SERVICE WITH BRITISH RAILWAYS. ALL ARE EQUIPPED WITH METCALFE-OERLIKON MODERN BRAKE EQUIPMENT.

ENGINEERS · ROMILEY · ENGLAND

TELEPHONE: WOODLEY 2626 TELEGRAMS: EXHAUST, ROMILEY

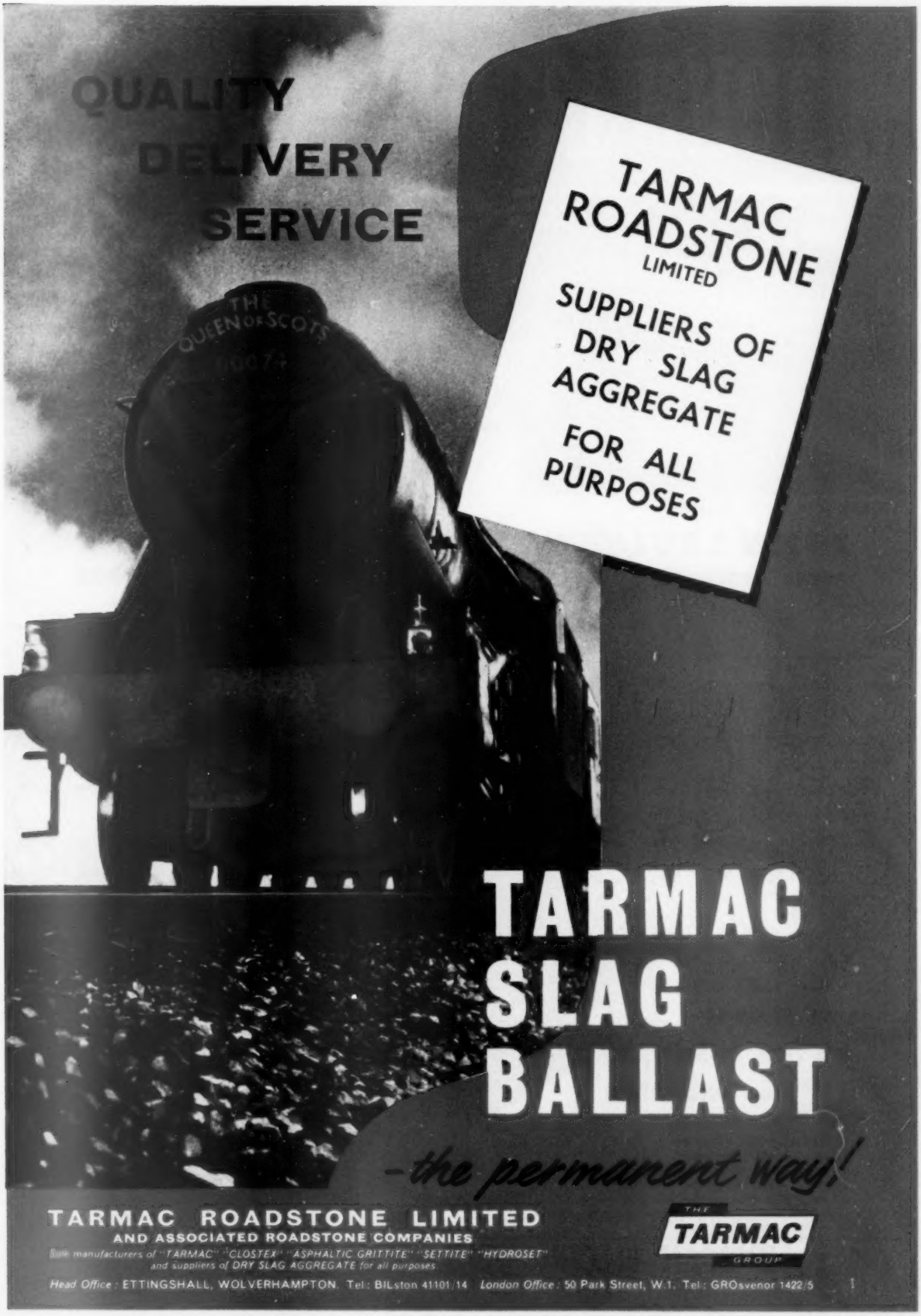
RG 13

We develop, design and manufacture for you

the diesel-hydraulic multi-purpose locomotive, type ML 3000 C'C', 3000 h.p.

diesel locomotives with hydraulic power transmission for main, branch and industrial lines, for every gauge, axle load and output up to 4000 h.p.

KRAUSS-MAFFEI MÜNCHEN
GERMANY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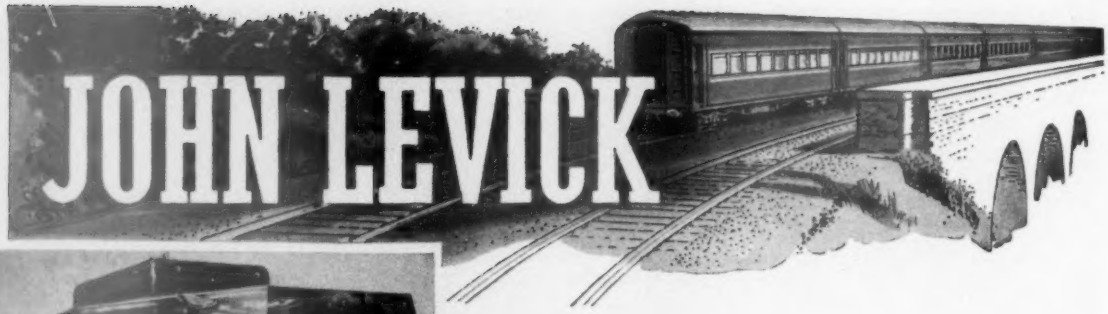

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PATENT

WASH BASINS

IN SOLID WHITE NICKEL METAL
OR STAINLESS STEEL

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Easily Cleaned

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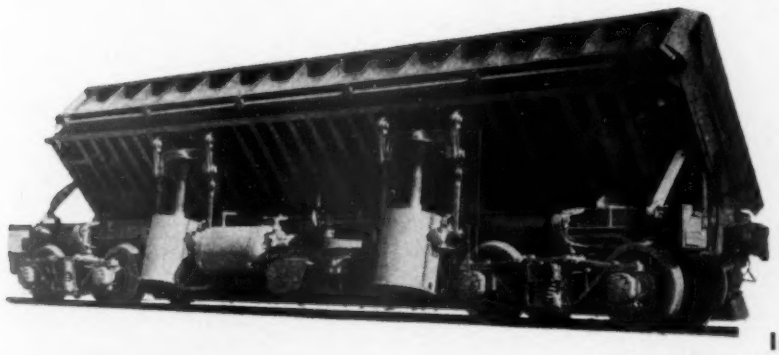
President Brand Gold Mining Co. Ltd.
50 Ton Ore Hopper Wagon



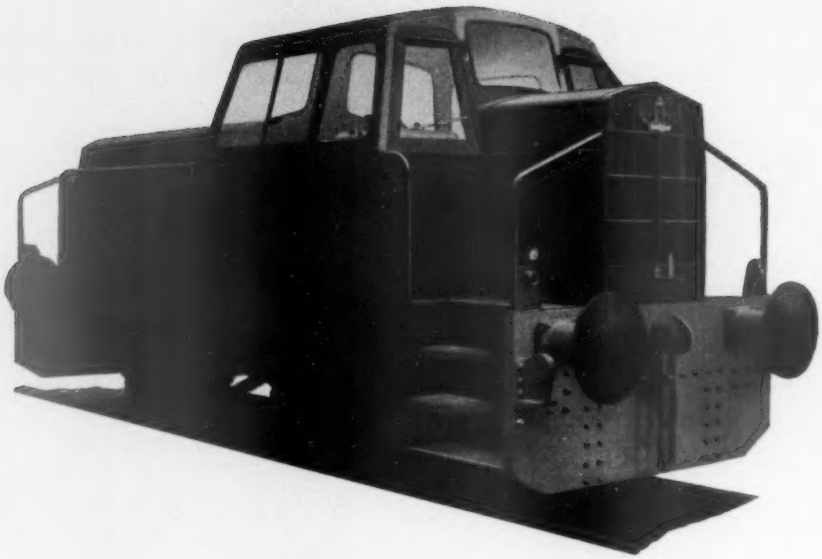
South African
Iron and Steel
Industrial Corporation
air- or steam-operated Dump Wagon
(Austin-Western patent)

South African Railways
Bogie Fruit Wagon

DORMAN LONG (AFRICA) LIMITED

GERMISTON, TRANSVAAL, SOUTH AFRICA

VZ000293



Sentinel chose

Laycock-Knorr

BRAKING EQUIPMENT

View of cab interior showing dual driver controls.

The new Sentinel 34 ton 0-4-0 Diesel Hydraulic Industrial Locomotives now going into service are all fitted with Laycock-Knorr compressed air brake equipment and pneumatic sanding gear.

This equipment, together with various other types of railway vehicle braking apparatus used extensively on the continent and developed by Knorr-Bremse of Munich over the last half century, is now manufactured and offered by

Laycock
ENGINEERING LTD
Millhouses · SHEFFIELD 8

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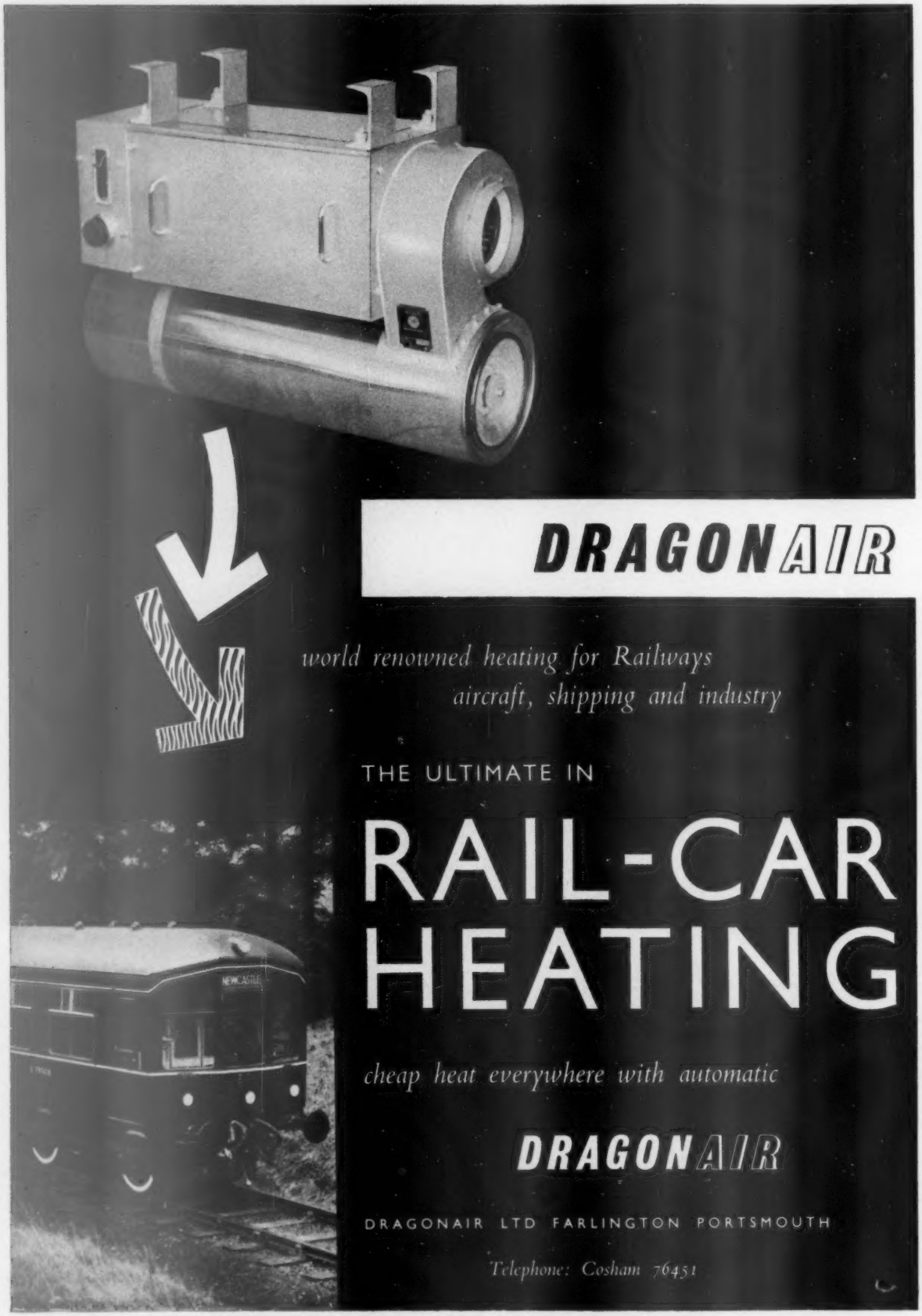
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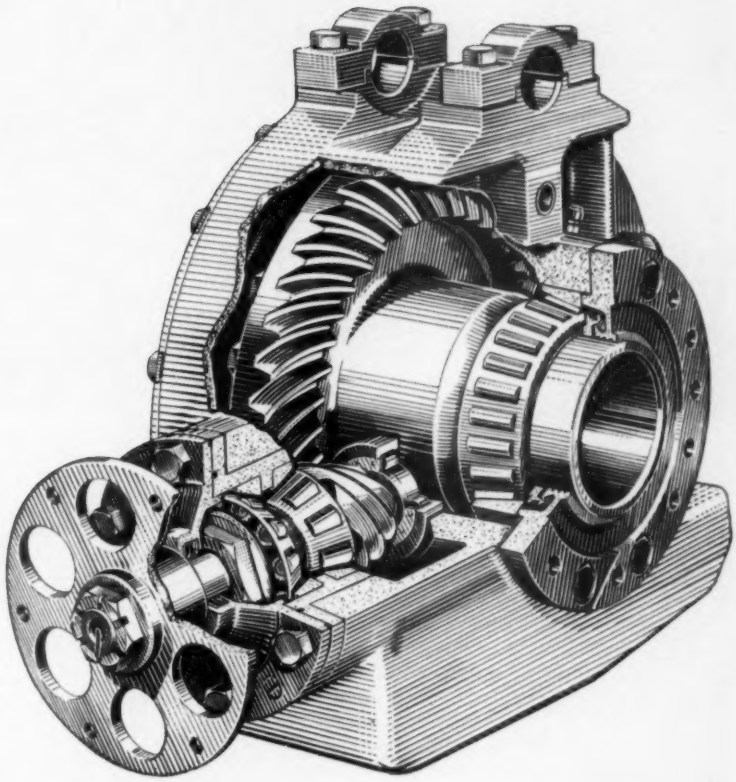

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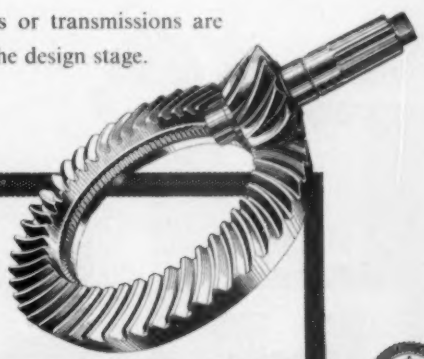

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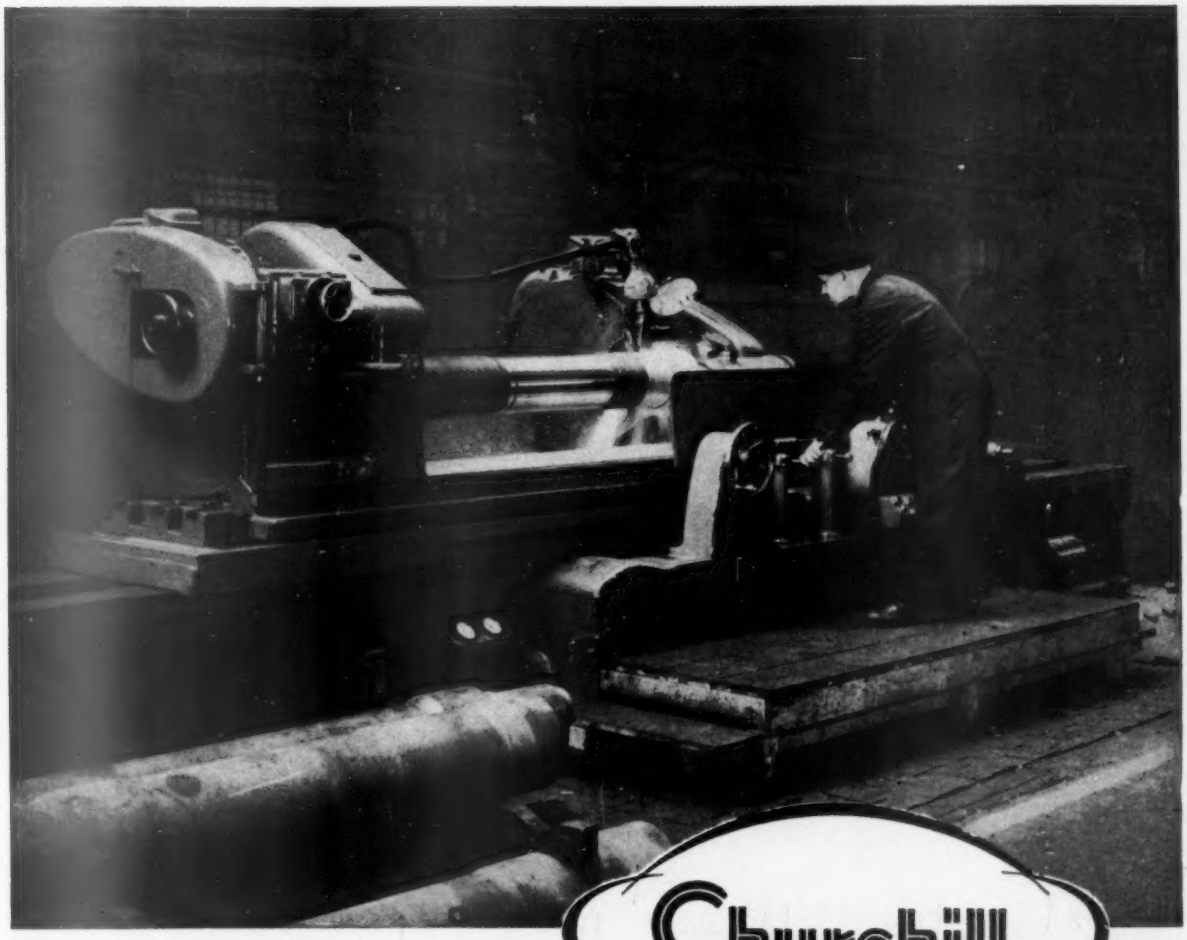

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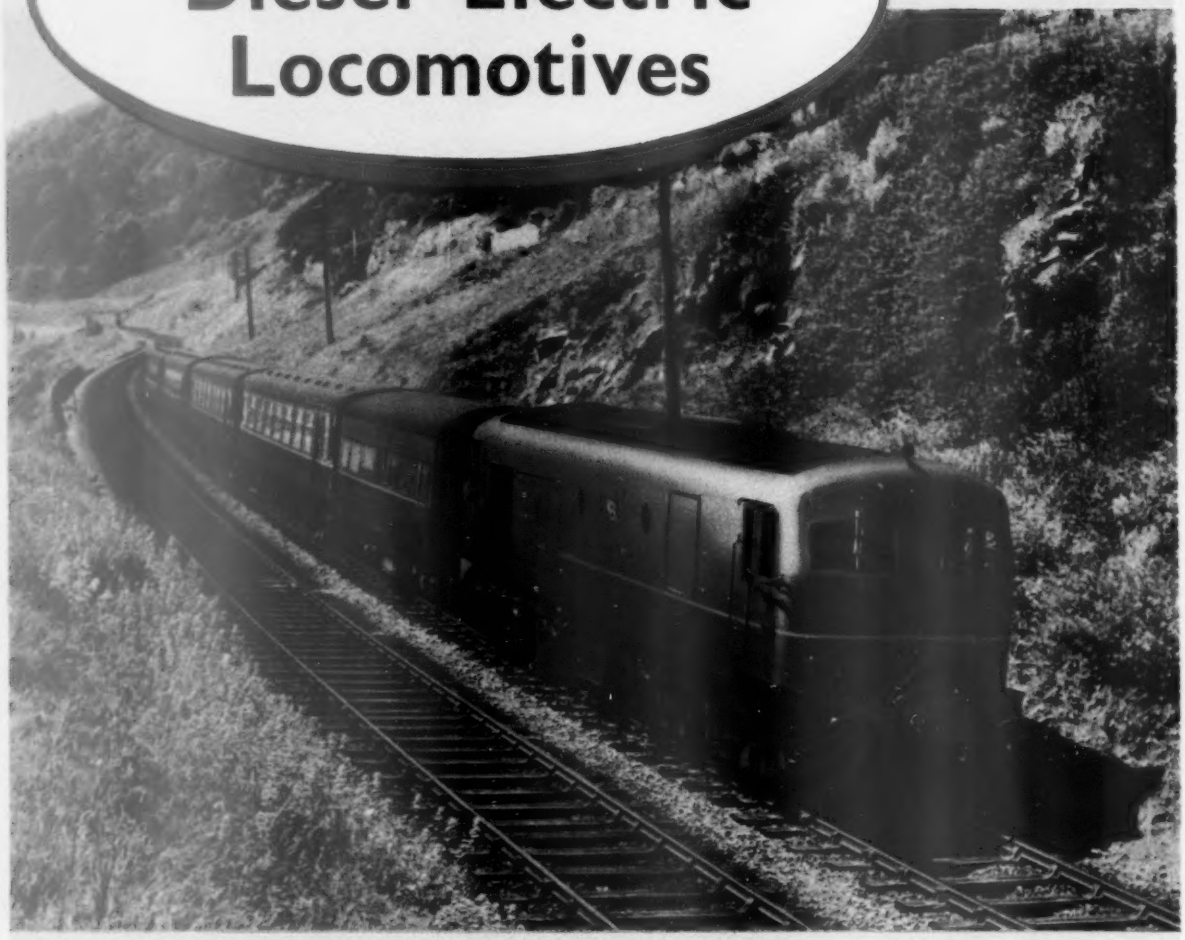

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A journal of Management, Engineering and Operation

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Public or commercial service ?

A POINT which has been in many minds for some time was put into words trenchantly by Sir John Elliot last week. Apart from his present position as Chairman of Thos. Cook & Son Ltd. and of the Pullman Car Co. Ltd., he has the advantage of a very long experience of railway affairs, which has included top management on the Southern and Midland Regions as well as the Chairmanship of the Railway Executive before its abolition under one of the several reorganisations to which the nationalised transport industry of this country has been subjected. Sir John Elliot said that sooner or later the public and the Government would have to face up to a decision as to whether British Railways were to be run as a public service or as a commercial enterprise. At the present time, they are such an odd mixture of both elements that, quite naturally, they are successful as neither. In several other countries, notably France, the public service principle is accepted and, in effect, the transport system is paid for by the public at large, whether or not as individuals use is made of the services provided. To an increasing extent that would appear to be the position towards which the system is moving in this country, but the fact is not recognised, and this is made obvious by the constant talk of making the railways pay, of dealing with their deficits, and the scrutiny of their expenditures. On the other hand, no commercial undertaking could possibly survive under the conditions which are imposed on the railways by Government, and which, presumably, are based partly on the idea of a public service. The whole matter is one which should be brought out into the open, and Sir John Elliot is to be congratulated on putting the position into words before an audience largely consisting of newspapermen. He was speaking at the annual dinner of the Fleet Street Railway Circle.

Fleet Street Railway Circle

THE FLEET Street Railway Circle, the membership of which consists of newspapermen with a lively interest in railway affairs, has become well-established as an organisation, and is one of which the value is recognised by the British Transport Commission and the regions of British Railways. The third annual dinner of the Circle was held on January 18 at the Great Western Royal Hotel, Paddington. Guests at the top table included Mr. K. W. C. Grand, Member of the British Transport Commission, Sir John Elliot, who responded to the President's toast of the guests, Mr. R. F. Hanks, another Member of the B.T.C., who is also Chairman of the Western Area Board, Mr. H. C. Johnson, General Manager of the Eastern Region, and Mr. J. H. Brebner, Public Relations Adviser to the B.T.C., who proposed the health of the Circle. A number of other railway officers was present. Mr. H. L. Haworth, who presided, obviously is himself very well-informed on railway affairs; Mr. Ian Waller was another speaker who expressed the sympathy of the Circle for the railways in their present difficulties.

Less home demand for steel

AFTER the record production of the British steel industry last year, it is disappointing to learn of reduced demands in the home market. Output in December averaged 451,000 tons a week, or 4 per cent over the previous best December figure. Production in 1960 was 24·3 million tons, an increase of 20 per cent on 1959 and 12 per cent above the record achieved in 1957. The Iron & Steel Board states that signs of weakness in the home market for sheet, strip, and tinplate are appearing in cancellation of orders and requests for deferment of deliveries. Export markets are influenced by plentiful supplies available from other countries, and there is keen price competition. Over the past few months, the Board announces, the rate of ordering finished steel has been a little below that of deliveries. There are good demands from constructional and civil engineering firms. Demand continues strong for many products, including plates, sections, and reinforcing bars.

Co-operation in electrical exports

ON January 17, over 130 export managers and senior executives of the electrical industry welcomed the suggestion that their trade association, the British Electrical & Allied Manufacturers'

Association (B.E.A.M.A.) should make immediate arrangements to put them in touch with makers of complementary equipment with a view to joint sales efforts, joint market research, and collective exhibitions overseas. It was decided that each concern represented would complete a confidential questionnaire, thus supplying details of the products it required to export, the overseas territories in which it would like to co-operate, any existing overseas facilities it would be prepared to share, and whether it would like to co-operate with other industries. Reference was made to the advantages of pooling resources, bearing in mind the high cost of maintaining fully-trained sales engineers abroad. Large companies offered to share overseas facilities with smaller concerns manufacturing complementary products. These practical measures are an indication of the electrical industry's determination to succeed in the export market.

Overseas railway traffics

OPERATING revenues of the Canadian National Railways for the month of November, 1960, amounted to $60,419,000. Expenses, taxes and rents totalled $57,639,000 resulting in a net operating income for the month of $2,780,000. In November, 1959, operating revenues were $58,161,000; expenses, taxes and rents were $60,637,000, and the net operating deficiency was $2,476,000. Receipts of the Paraguay Central Railway continue to fluctuate. On November 25, 1960, aggregate receipts from the beginning of the financial year were G5,091,715 less than in the corresponding period of 1959. Since then receipts have improved and this figure was reduced to G2,666,424 on January 6, 1961. Costa Rica Railway receipts for November, 1960, amounted to colones 2,403,452 compared with colones 1,905,591 in November, 1959, an increase of colones 497,861.

Regional news-sheet development

OF PARTICULAR interest in view of the current emphasis on the importance of inter-communication between management and staff, the Eastern Region News draws further attention to itself this month by appearing in eight editions. This news-sheet, which is an established function of the internal relations activities of the Eastern Region of British Railways, has been produced in four editions since its inception, one each for the Great Eastern, Great Northern, and London, Tilbury and Southend Lines, and one for the Region as a whole. Now separate editions also are produced for the Continental, Civil, Mechanical & Electrical, and Signal Engineering Departments—the overall regional edition will circulate only to Headquarters staff. It is thought and, in our opinion, correctly, that this move will give the publication greater appeal to particular groups of staff. To foster this appeal, " local " news has been brought from the back page of each edition to the front.

Action, not words

ANGERED at the " conspicuous absence of the British Government's representative " at an exhibition of his company's products in Hamburg, Mr. Frank Elvy, Managing Director of Cimex Limited, recently observed that an official of the Federation of British Industries had come all the way from Cologne to show his interest while the British Consul, stationed just round the corner from the exhibition, had not been represented. Yet the Cimex company, together with other Kentish industrial concerns, had recently been treated to a full-scale luncheon at which Lord Hailsham had stressed the Government's concern that local industry should do everything in its power to enhance the export drive. Mr. Elvy thought it was nice to know the Government was so concerned, but why did it not put a squib behind its representatives ? Of the Institute of Directors' campaign—Export/Action Now—Mr. Elvy has commented: " Action now is a magnificent idea. But let's have action, not words. If conference jargon and expensive luncheons could sell goods, this country would have no balance of payments problem. Get out and sell, and stop talking."

Seeing signals round curves

THERE is a certain similarity between the sidelong collision outside Newcastle Central on July 25 last and the collision at Borough Market six months earlier. In each case trains were travelling on parallel and converging lines round a curve, and in each case the driver of one train misread as applying to him the signal which had been cleared for the other train. At Newcastle, as Colonel W. P. Reed points out in his report summarised on page 113, a freight train over-ran its signal, and collided with a passenger train which had been signalled to cross on to the line on which the freight train was proceeding. This was a perfectly proper movement, especially in a colour-light and low-speed area, but Colonel Reed comments on the short over-run between the signal where the freight train should have stopped and the fouling point ahead, and suggests that when practicable an existing alternative route should be used. He also calls attention to the comparative difficulty of seeing narrow-beam colour-light signals round curves when there are several on the same gantry. Several Newcastle signals, including those concerned in the accident, have now been re-equipped with " spread-light " lenses giving a wider beam.

Productive year for S.N.C.F.

INCREASES in the traffic and productivity of the French National Railways were a feature of 1960. Goods traffic totalled 226 million *tonnes* (against 213 million in 1959) and 56,500 million *tonne*-km., a rise of 5·8 per cent. Last year was the best since the war for goods traffic, which was 5·4 per cent more than the record of 1957. Whilst passenger journeys at 568 million showed no change from 1959, passenger-km. fell slightly. The main reason is the growth of Paris suburban traffic, with its short journeys; the number of suburban passengers rose from 265 million in 1953 to 321 million last year. The total of goods *tonne*-km. and of passenger-km. in 1960 exceeded the 1959 figure by 3·4 per cent and the 1957 record by 2·4 per cent. These movements were effected with a fleet of 7,590 motive power units of all kinds, against 7,860 in the preceding year. Consumption of coal and electric current combined fell by 3 per cent in terms of coal tonnage. The number of staff was 354,000, compared with 359,000 in 1959.

More camping coaches

INCREASED opportunities are possible this year for inexpensive holidays in some of the most attractive surroundings in England, Scotland, and Wales. All Regions of British Railways are making available more camping coaches, from mid-March to mid-October. Another 26 Pullman type coaches are being added, making 227 coaches in all, on 134 sites. There is sleeping accommodation for four, six, or eight; a living room; and kitchen. Cooking utensils, bed linen, and so on, are provided. The coaches adapted from Pullman cars, accommodate six, and their superior appointments include sprung mattresses. Weekly rentals vary from £5 15s. to £12 10s. for ordinary coaches and from £8 to £15 15s. for Pullmans. Holiday accommodation also is available in converted buildings, usually on closed branches, in the Scottish and North Eastern Regions.

Norfolk & Western thrust to Great Lakes

A BID to reach the Great Lakes is being made by the Norfolk & Western Railway. A merger and physical connection are planned with the Nickel Plate system, of which the official title is the New York Chicago & St. Louis Railroad. Last month

the N. & W. announced its plan to buy the 113-mile branch of the Pennsylvania Railroad from Columbus to Sandusky on Lake Erie. That would provide the link with the Nickel Plate and give the N. & W. direct access to the Great Lakes, such as the Chesapeake & Ohio Railway already has at Toledo. It would also afford a junction at Bellevue, Ohio, with the Wabash Railroad. Another Norfolk & Western project is to lease the Wabash, with the intention of an eventual merger. The N. & W. then would have access to Chicago, St. Louis, and other centres, including Buffalo, for the Wabash operates some 2,400 miles of line, of which 245 are in Canada, on the north shore of Lake Erie. These plans clearly have the support of the Pennsylvania, which in a good year draws dividends of $10 million from the N. & W. and of $5 million from the Wabash.

Further tour for roadrailer

THE "ROADRAILER," Britain's latest transport development which can run on road or rail and combines the advantages of both forms of transport (described in our September 9, 1960, issue), has recently been shown on week-long exhibition in London, Birmingham, Cardiff, Manchester, Glasgow, Leeds, Sheffield, and Southampton. A second and more comprehensive tour will begin early this year, to include the following centres: Aberdeen, Brighton, Bristol, Carlisle, Derby, Doncaster, Dundee, Edinburgh, Grantham, Humberside, Leeds, Leicester, Lincoln, Liverpool, Maidstone, Newcastle, Norwich, Nottingham, Reading, Sheffield, and Tees-side. Other towns may be included later. The "Roadrailer" can transport big loads at fast speeds and has a high payload to tare-weight ratio. The body can be of any known type such as open, covered, tank, or pressurised. It offers virtually shock-free door-to-door transport, and goods remain untouched during the journey.

Apprentice of the year awards

THE PRESENTATION of the Apprentice of the Year Awards is to be made by the Duke of Edinburgh in conjunction with Commonwealth Technical Training Week, on June 1. This should prove an incentive to embryo leaders of Industry and Commerce. The object of the scheme is to select outstanding apprentices throughout the United Kingdom and offer them, by means of travel, the opportunity to widen their horizons and advance their education. The awards will be made to apprentices in three categories: Technical Apprentice, Craft Apprentice, and Commercial Apprentice. All applicants will be interviewed regionally and one applicant in each class, from each of seven regions, will go forward to a National Final, at which the winners will be selected. In making their selections the judges will be asked to consider character and personality as well as technical achievement. Success at the National Final will entitle the Technical Apprentice to a stay of nine months in Australia, the Craft Apprentice to six months in Canada, and the Commercial Apprentice to six months in the United States of America.

The British Railways Board

ALTHOUGH the recent White Paper on the reorganisation of the nationalised transport undertakings has been so widely drawn that the intentions of the Government remain nebulous in the extreme, there are some aspects of it which are fairly obvious and which would appear to indicate that the thinking of the draughtsman was, at least, a little muddled.

From the railway point of view, the most important proposal must be the establishment of the British Railways Board which, so far as the railways are concerned, will replace the British Transport Commission in that it will take over the railway assets, including the workshops, and the responsibility for the capital debt of the railways as a whole. Exactly what is meant by the phrase in the White Paper "the board will perform only those central functions which are essential to the running of the railways as a single entity" must, at this stage, remain conjectural. It could mean a very great deal and carry with it a staff not dissimilar in numbers to that now obtaining with the British Transport Commission. On the other hand, it could mean almost equally well a very much smaller number of extremely highly-specialised staff, or even something between those two extremes.

The Minister has made it clear that although the legislation required to give effect to the proposals in the White Paper cannot be expected to become fully effective until 1962, it is his intention, and, therefore, presumably that of the Government, that the Railways Board should be created as a "shadow" body at a very early date. The object and the effect of this would be to begin to put into effect broad principles of railway reorganisation with as little delay as possible. Another effect would be to anticipate the decision of Parliament in this matter, but presumably the Government is sufficiently confident of its strength to be convinced that this is a relatively minor undemocratic exercise. When one comes to consider exactly how this shadow Railways Board will be created and will function in the interim, the position is rather more complex than might appear from a cursory study of the White Paper.

The British Transport Commission, in its present form, can hardly be wound up until the new legislation is passed. Until that time, legally, it must continue to exercise its present powers and responsibilities. It could therefore create, as one of its own departments, the shadow Railways Board. It is clear that an extraordinary position must arise. Whatever viewpoint might be held elsewhere, it would seem to be clearly the opinion of the Government that the British Transport Commission as such is an unsatisfactory or a discredited instrument. If it were not, it would hardly have been scheduled for destruction. If, on the other hand, the new Railways Board is, in the judgment of the Ministry, the better instrument for the conduct of the railways, it would seem a little strange that that board should be for two years—and in its most formative period—subject to the overriding scrutiny and approval of the Commission.

The White Paper states that the Chairmen of the five major boards envisaged by the White Paper will be appointed by the Minister of Transport and that the members of each of these boards will be similarly appointed after consultation with the Chairman of each board. Unless the Minister anticipates the new legislation in these appointments, it would be reasonable to assume that the shadow Railways Board would be set up, in effect, by the British Transport Commission and that, when Parliament has passed legislation, all the then Minister will have to do will be to endorse the selection already made. Probably the position will not be quite like this; it is more likely that these appointments to the shadow bodies will be made in active consultation with the Minister which, indeed, would be no great departure from practice.

On the other hand, it could hardly be contested that the British Railways Board, pending the passage of legislation on the basis of the present arrangements laid down in the White Paper, must be subservient to the overriding authority of the British Transport Commission. In other words, any proposals which the British Railways Board may wish to make to implement its ideas on the future of the railways will have to be submitted to and agreed by the Commission. In the circumstances which have arisen, and leaving on one side the fact that there can be no doubt a situation of this kind could be overcome by the exercise of extraordinary good will and accommodation by the parties concerned, whoever they may be, the situation on a logical basis is ludicrous. If it were implemented it could only mean the constant exercise of great tact and compromise at the best, and, at the worst, it could lead to a situation which could become completely impossible for both parties.

There has been no clear indication from the Government as

to how its mind is working in the matter of the selection of the Chairman or members of the British Railways Board, but it is clear that this will not be a very small body. It is to consist of a Chairman and Vice-Chairman, a representative from each of the Regional Railway Boards, and one or two part-time members; these alone give a minimum number of nine or 10. In addition, there are to be "certain full-time members with special responsibilities." Presumably the most senior railwaymen in British Railways at the present time are Mr. K. W. C. Grand and Mr. John Ratter, who are members of the British Railways Sub-commission, the other two members of which are Mr. H. P. Barker and Mr. F. Donachy, part-time members of the British Transport Commission. Both Mr. Grand and Mr. Ratter are full-time members of the British Transport Commission. If the chairmanship of the British Railways Board were to be vested in either Mr. Grand or Mr. Ratter, is it reasonable that they should be expected to refer back for approval any ideas they might have for the conduct of the British Railways Board to themselves as the railway members of the Commission, or to the Commission as a whole, which, because of their specialised knowledge, might reasonably refer the proposition to them, or that the Chairman of the British Railways Board, whoever he might be, should refer his proposals to the Chairman of the B.T.C., who is under notice to disband his organisation?

This is not an argument based on personalities—it is merely an illustration of the lack of thought and complete disregard of practicalities which is basic in the White Paper. It is not uncommon for a Government White Paper, whether on transport or other matters, to be a pretty fuddled concoction. Fortunately, a White Paper is little more, at base, than an expression of intention or hope by the Government of the day. There is no good reason why any White Paper should not be considered as little more than a tentative draft of proposals and subjected, as many have been, to a pretty thorough re-writing in the process of Parliamentary procedure. There is every good reason why this particular White Paper should be treated in this way. The Minister of Transport will have an admirable opportunity to clear up some of these points during the debate early next week. It is certainly an opportunity that he should not miss.

Specialised role of railways

"IT is a well-known fact that no great skill is involved in running a railway system. At least, this is the conclusion to be drawn from the ready willingness of Parliamentarians, the Press, and the general public to point out at every opportunity just how the job ought to be done." This statement, which applies to other countries besides Australia, was the forthright opening to a recent lecture at the Australian Royal Institution of Public Administration by Mr. E. H. Brownbill, Chairman of the Victorian Railways Commissioners. He was contributing an address, one of a series entitled "The Challenge to Public Administration in a Developing Australia," given by heads of Federal and State Governmental utilities and other activities. Some very sound thinking is the basis of his well-expressed views. Stressing the specialised function of the railways as mass point-to-point carriers, he explains, why "far from being finished, the railways are only just getting started." The reason why so much advice is given by outsiders to railway managements on many aspects of administration is, he rightly states, the apparent simplicity of railway problems to the superficial observer.

Twenty-five years ago it was fairly generally accepted that railways in Australia at least were on the way out, doomed by the flexibility of the internal combustion engine and the rubber tyre. To a limited extent, he admits, this was true. Development of road transport has led to closure of many lightly-trafficked branch lines and poorly patronised stations on main lines. The effect of this on the railways, he maintains, has been "nothing but beneficial, for these services represented railroading in its least attractive and most uneconomical form." Road transport development has transformed Australian railways, in Mr. Brownbill's phrase, "from general practitioners into specialists." The process is far from complete. It is being accelerated by the rapid growth of industrialisation and by development of new techniques of co-operation between rail and road. The main specialist activity is bulk movement of goods. Besides wheat and other primary products, superphosphate, brown coal and briquettes, which have always been a large proportion of the business of the Victorian Railways, industrialisation is affording new traffics such as steel products, bulk cement, motorcars, and liquids in bulk.

Increasing use and development of new types of container, various forms of piggy-back transport, and the bulk loading schemes of forwarding agents are enabling Australian railways to deal largely in bulk with less-than-wagon-load traffic. The new techniques, he emphasises, are important steps in the direction of total transport economy, because they concentrate on bulk movement by rail from terminal to terminal; this is the aspect of railway transport in which the greatest savings, in relation to road transport, can be obtained. Road transport performs essential collection and delivery. The techniques also extend the railways' ability to exploit the economies of size. Every additional ton of traffic brought by containers, road vehicles for piggy-back carriage, and so on, reduces the unit cost of every ton moved by rail without increasing the unit cost of the traffic remaining on the roads. The importance of size or volume in railway operations and costs is vital in Australia, where, because of the sparsity of population, the railways work much closer to the lower limit of traffic volume below which economic operation is impossible.

To give any railway service at all, of a standard acceptable in today's highly competitive market, it is necessary to have tracks, structures, and signalling systems that are very costly initially but can handle heavy traffic without further substantial expenditure, either of a capital nature or on maintenance. The cost of these facilities, measured on a ton-mile basis, can vary between very wide limits and can become prohibitive if traffic volume falls below a certain level. The Victorian Railways, working not very far above this level, have a very great potential for reducing the overhead portion of ton-mile costs if traffic volume can be increased. At current traffic levels in Victoria overheads represent approximately two-thirds of railway ton-mile costs. Following the argument in the opposite direction, Mr. Brownbill points out how vulnerable are Australian railways to a decline in traffic volume from existing levels. A temporary fall can be met by emergency measures such as the deferment of certain classes of maintenance; but a permanent decline could have one of only two results: enormously increased deficits or, if expenditure were to be cut proportionately to income, a rapid deterioration in the physical condition of the railway.

Apart from the total volume of traffic, the size of individual consignments, that is to say, the total volume of goods involved in a particular traffic movement, has an important bearing on railway operation. It is axiomatic, he states, that the main advantage of railway transport is the ability to consolidate many separate units of traffic into heavy trainloads on a segregated right-of-way so obtaining a high ton-mileage per unit of fuel and manpower. Where railways have the greatest advantage is where the unit of traffic is the train-load rather than the wagon-load. In that case there is no time lost in marshalling yards. As each vehicle is loaded to capacity the question of wagon-load minimum weights for rate-fixing purposes does not obtrude and the train can be made up of high-capacity bogie rolling stock fitted with passenger-type bogies for high-speed running. Accountancy and statistical operations are also simplified.

The main difficulty of the Victorian Railways in making the re-adjustment to their more specialised role has been the battle put up by outside interests to retain railway services no longer economically justified but which confer a sectional

benefit or contribute something towards local prestige, and land values. Apart from this, the community as a whole in Victoria has only a vague and confused idea as to what it expects of its railway system. Should the Railway Department be regarded as a branch of the public service, contributing to the general development and welfare of the State without yielding commensurate returns by way of direct revenue, or should the Department be run strictly as a business, providing only those services which can be operated at a profit in the commercial sense? Nobody, Mr. Brownbill states, seems to know. That is true also of most other countries where there are railways. He believes that if the issue were put to the test, the weight of public opinion in Victoria would be found in favour of the former viewpoint, which dominates current policies in the State. That does not prevent the Railways Commissioners from attack from all directions because such a policy is incompatible with making profits. Accepting that public opinion requires the Railways Department to be run on lines which are not business-like, in the commercial sense, the Commissioners face the problem : If profit or loss is not the criterion by which administrative decisions are made, what criterion is left ? The effective, if not altogether precise, test used is what he terms the " test of comparative costs." The Victorian Railways will not undertake any transport job if it is shown that the costs to the railway, measured in resources used, are higher than can be offered for the same work by any other means of transport. The practical effects of this is the closing of branches, withdrawal of some passenger services, and the abandonment of proposals for the construction of certain new lines. The principle also has an important bearing on allocation of our annual allotment of loan funds. It cannot be applied with complete precision simply because the necessary data are imprecise. In practice the issue is usually so clear-cut that a small degree of uncertainty is immaterial.

Railway operation in 1960

BY A CORRESPONDENT

AN estimate of the volume of freight traffic on British Railways in 1960 can be based on Number 12 of *Transport Statistics*, which gives figures to December 4, and on the statement of receipts for the last four weeks of the year. In 48 weeks of 1960 the railways originated 229,720,000 tons of freight train traffic, an increase of 15,673,000 tons, or 7·3 per cent, on 1959. Resultant receipts were higher by £6,841,000, or 2·9 per cent. Unhappily freight train receipts declined by £910,000 in the last four weeks of the year, reducing the rise in freight revenue to 2·2 per cent. As the railways worked in 48 weeks 965 million, or 6 per cent, more ton miles, the net revenue position may not have improved. The total 1960 tonnage may not reach 250 million, compared with 274 in 1957, 289 in 1953 and about 300 million in 1937, the last good year of the old railway companies before the war.

All Regions helped to gain more freight train traffic than in 1959. The North Eastern had the largest rise of 4,542,000 tons (9·5 per cent). Its forwardings of 52,326,000 tons were more than a fifth of the all-line aggregate and it loaded over a quarter of all coal and coke put on rail. Many of its hauls were short because of a partial revival in coal shipments at Blyth and other places on the North East coast. It is not always easy to cope with these sudden fluctuations in traffic. The Eastern Region carried 9 per cent more coal and raised its total traffic by 3,953,000 tons, or 10·5 per cent. In Scotland there was a slight decrease in coal, but exceptional increases of 351,000 tons in merchandise and of 1,884,000 tons, or nearly 37 per cent, in minerals.

Passenger statistics are not closely up to date. During 10 months to October, British Railways carried 856 million people, 38 million fewer than in 1959. In the month of October alone the drop in passenger journeys was 9,686,000, over 10 per cent, the Southern Region losing 4,376,000 and the Eastern 2,202,000, a proof that electric train services are not immune from competition. Altogether in that month the railways lost a fifth of 1959 first class travel and a tenth of second class carryings. Takings were £528,000, or 4·6 higher, the average first class fare being nearly 5s. more than in 1959, and the second class fare up about 5d. For the year 1960 passenger receipts totalled £150,542,000, an advance of 7·8 per cent on 1959, but net passenger revenue is not known.

In 48 weeks of 1960 British Railways worked 113,239,000 freight train miles, an increase of 1,393,000 miles, or 1·2 per cent on 1959. Steam mileage declined by 3,929,000, or 3·6 per cent to 103,941,000, while diesel mileage increased by 5,087,000 to 7,542,000 and electric locomotives worked 1,756,000 train miles, 234,000 or 15 per cent more than a year ago.

Steam freight train speed slowed by 3 per cent to 9·2 m.p.h. Diesel train speed improved by nearly 2 m.p.h. to 10·7 and would have been higher if the London Midland Region had not dropped its rate of progress by nearly 5 per cent to 7·1 m.p.h. The Eastern Region worked more than half of the total diesel freight movement at a speed of 10·5 m.p.h. and Scotland ran a third of the Eastern's mileage at over 12 m.p.h. The North Eastern, with a stock of 54 diesel-electric train locomotives, turned out 832,000 freight train miles at the rate of 21 in a train hour. The area has long runs from York to Newcastle and then farther north so that it can keep its diesels steadily at work.

In the hourly output of freight train operation the Eastern leads the way, turning out 1,296 net ton miles in a train hour, against the all-line average of 1,164. Its train load of 168 tons is fully a ton less than the L.M. Region load, but 15 tons above the Western and 22 tons over the North Eastern average, though that Region records an average wagon load at starting point of nearly 12 tons compared with the all-line figure of slightly over 10 tons. The mobility of the Eastern's operations is confirmed by the working of 224 wagon miles in a train hour compared with the Western statistic of 194.

At December 4, the operating stock of steam locomotives was 12,705, with 2,595, more than a fifth, under repair. Of 573 diesel mechanical and hydraulic engines 69, or 12 per cent, were unserviceable. The state of the diesel-electric stock of 1,905 locomotives was worse with 310, or 16 per cent, out of service. To complete the list of casualties, 28 of 131 electric locomotives were cripples. Of a total stock of 15,314 locomotives of all types, the number unfit for service was 2,002, nearly 20 per cent. When it is added that 9 per cent of both diesel and electric multiple-unit passenger carriages were under repair, it is evident that the motive power of British Railways is in a parlous state.

LETTERS TO THE EDITOR

THE EDITOR IS NOT RESPONSIBLE FOR THE OPINIONS OF CORRESPONDENTS

RETURN TO THE ATTACK

January 10

SIR, In the first paragraph of your editorial, " British Railways Vindicated," your issue November 25, you labour with grave courtesy, considerable eloquence and possibly with your tongue in your cheek to convince me, and other Philistines from overseas, that British Railways cannot learn to wash behind its ears.

If British Railways' mechanisation is so lagging and its labour force so averse to arduous and dirty work that it is impossible to clean coaching stock properly, then surely the British Transport Commission can obtain authority from the Ministry of Labour and the Home Office to introduce Italian or other foreign labour, avid for any kind of a job, at the wage scales paid by British Railways. Alternatively, British Railways could offer, as an incentive to its own labour to

perform this work, bonus pay, known, I believe, amongst stevedores on the docks as " dirty money " or " stink money."

It is obviously nonsense to accept a state of filth as the normal condition of British Railways coaching stock. Under private ownership both coaching stock and locomotives were maintained in a clean, spick-and-span condition. That it is not the case with British Railways is another example of the inept, incompetent and lackadaisical management, characteristic of official and semi-official entities in all countries, where no one is responsible for nothing to nobody.

You believe that complaints expressed to me, by members of the staff of British Railways, will be removed by the acceptance by the Government of a report to ensure fair wages for British railwaymen. The melancholy truth was that the average railwayman did not believe a word of it. Some comments of staff members to me were Anglo-Saxon in their terse pungency.

The relation between management and labour on British Railways, is intricate and viewed with considerable scepticism by the railwaymen, who, rightly or wrongly, believe that the morale of management is even lower than their own. The staff will tell you quite frankly that they feel that management is uncertain, erratic, obviously somewhat demoralised, and without confidence in the future of British Railways, probably the result of the bedevilment to which the Executive has been, and continues to be, subjected by politicians of all parties at Westminster.

The railwayman does not consider his lot to be a happy one, but he understands the plight in which Sir Brian Robertson and his colleagues find themselves, faced with a Government and a House of Commons clearly prejudiced against British Railways and hostile to measures necessary to restore British Railways to solvency. If bumbling bureaucrats and meddlesome politicians, innocent of all understanding of transportation problems in Britain, would only keep their paws off British Railways, the Commission could work out its own salvation without having to plunder the taxpayer periodically to cover its deficits.

You also accuse me of resurrecting the hoary public resentment, " Why can't we have fast trains like they have on the Continent ? " Not so. The public does not expect timings as fast as they are on the Continent, but the public has every right to expect service on a par with the service it received from the privately-owned railways in 1939. It does not get it.

The former M.S.L. Railway was generally known as the Mucky, Slow and Lazy. British Railways evidently took this as its slogan, and is doing its best to live up to it.

Old stock ? Certainly we know that it is scheduled for replacement, but when? Incidentally, much of the older stock is more comfortable and rides more smoothly than the modern equipment, and it could give many more years of satisfactory service, were it kept in decent repair and reasonably clean. It is not the retention of old stock in service, but its appalling condition that rouses criticism from the public.

Unpunctuality ? British Railways were unpunctual in 1951, 1955, 1959, and had not improved in 1960, the years of my visits home. If the cause of unpunctuality is modernisation, around bottlenecks arising on the most intensely worked railway system in the world, producing some disruption, then we must assume that British Railways intends to be unpunctual over a massive period of not less than 20 years, stretching from 1951 until the end of modernisation, which certainly will not be before 1970. No, unpunctuality, on the scale with which it infests British Railways. is another symptom of careless, irresponsible supervision. Nobody is individually held responsible, so nothing is done about it.

You draw attention to the rises in all classes of British Railways freight traffic detailed on page 615 of this same issue, giving the credit to the installation of modern equipment and facilities, together with the introduction of more efficient methods of operation. Before you sound too loud a peal of vindication on British Railways trumpet, how much of the increases represents business recovered from British Railways competitors and how much is the normal share of British Railways of the general increase in nationwide productivity? Similarly, how much of the increase in passenger revenues was produced by increases in fares and how much was produced by more passengers travelling longer distances ?

In former issues you have lamented that British Railways movement of coal & coke had seriously decreased and attributed much of British Railways financial difficulty to this decrease in coal traffic. You have complained in the past that the physical plant of British Railways was not being used to anything like capacity and yet, under Questions in Parliament on page 636 of the November 25 issue, I see that the B.T.C. and the National Coal Board were making special arrangements and diverting some coal traffic to the roads, arrangements having been made to enable quite a lot of coal to be moved by road to the power stations, thus freeing the facilities for the movement of other coal.

To me this reads like a page out of Alice in Wonderland and I expect it will puzzle other literal minded taxpayers, who have the privilege of making up British Railways operating deficits out of their pockets.

A powerful and influential block at Westminster burns with zeal to construct numerous additional expressways, widen existing main roads, and improve the network of highways in general. To hearken to them gives the average ill-informed man in the street the impression that roads in Britain are impassable sloughs over which patriotic holders of " C " licences, operators of road services for hire, and bus and coach operators heroically struggle to give the public a transportation service at tremendous personal sacrifice that is capriciously denied them by that incompetent monopoly, British Railways.

In their eyes, it is a patriotic duty to deny funds for modernisation of the Nation's railways, but it is equally their patriotic duty to squander hundreds of millions of public funds on totally unnecessary additional expressways and road improvements, because they and theirs will profit from it, whereas funds provided for British Railways modernisation will profit, not the individual, but the community in general, which, after all, is the ultimate owner of British Railways.

So once again the defenceless, inarticulate, unorganised British taxpayer is going to be plundered and plucked, squeezed and mulcted, stripped and financially ravished, to the greater profit of " C " licence holders, bus, coach and road service operators and the contractors, who will secure juicy profitable contracts for construction in connection with the highway programme. In addition, as a consolation, the wretched taxpayer will have to pay for even larger operating deficits, which will result on British Railways.

In case it is of interest to you, I am merely the Chief of the Commercial Department and Freight & Passenger Agent of this railway in Guatemala.

Yours faithfully,

CHARLES JOHN GREGG

International Railways of Central America
Guatemala, C.A.

CONCRETE SLEEPERS

November 30

SIR, I note the article by a correspondent in your issue of May 20, 1960, on concrete sleepers. For the purist, is the principle of pre-stressing now conventionally described (for the alternative methods of tensioning the steel) as either " pre-stressed " or " post-stressed " when referring to pre-stressed concrete ?

Perhaps lots of things can be post-stressed including plain, and reinforced concrete, but is the term post-stressed now accepted as an alternative means of describing what was once understood to be the fundamental difference of pre-stressed concrete?

Yours faithfully,

" STRICTOR "

Victoria, Australia

The Scrap Heap

Not quite nice

During 1851-52, J. E. McConnell produced the first of his famous 2-2-2 locomotives with inside cylinders and frames throughout. Their somewhat exposed appearance reminded the men of the London & North Western Railway of Amelia Bloomer's unhappy attempt at dress reform, and consequently they were nicknamed, in honour of her scandalous pantaloons, the " Bloomers." The name stuck.

Rough riding

Recently a youth of 18 drove, closely pursued by a freight train, along a three-mile stretch of railway track near Atlanta, Georgia, U.S.A. He was later charged with drunken driving.—*From the "Daily Express."*

Lineal descent

Southsea's famous " Bikini Girl " . . . began life as a railway poster, and her appearance in the briefest of costumes advertising the resort led her to be called " a moral danger." When the poster was altered about 18 months ago, the bikini girl remained but she had blossomed forth as a more homely—but still shapely—young mother, complete with baby daughter. Now, on the cover of the 1961 Southsea Guide the . . . same design has been extended to include " Dad " and a young son, also in bathing costume.—*From " The Evening News."*

Finders keepers?

An Oldham magistrate has been reported as stating that a British Railways system of leaving mailbags unguarded on a station approach was " a temptation to the public which ought to be removed." He said that in view of this the magistrates were considering " with a certain amount of reserve " the case of two men accused of stealing four mailbags from an Oldham station.

More power at their elbows

Copper thieves cut and removed a section of inch-thick power cable from the railway at Speke on January 7. A railway official said later: " They are lucky to be alive. Had they cut the cable a mile nearer Liverpool they would have been on the three-mile stretch which we made live with 25,000V. at midnight for training purposes."

False prophet

The gross exaggeration of the powers of the locomotive or, to speak in plain English, the steam-carriage, may delude for a time, but must end in the mortification of those concerned. What can be more plainly absurd and ridiculous than the prospect held out of locomotives travelling twice as fast as stage coaches! We trust that Parliament will, in all railways it may sanction, limit the speed to eight or nine miles an hour, which we entirely agree is as great as can be ventured on with safety.—*From the "Quarterly Review," March*, 1825.

Any more for the Skylark?

Because the 7.15 a.m. train from Orpington (Kent) took the wrong line on December 24 and went to Chislehurst, some early travellers to Blackfriars and Holborn had an unexpected trip. At Chislehurst, the train was turned back to Orpington, where passengers caught the next train to Holborn about half an hour later.

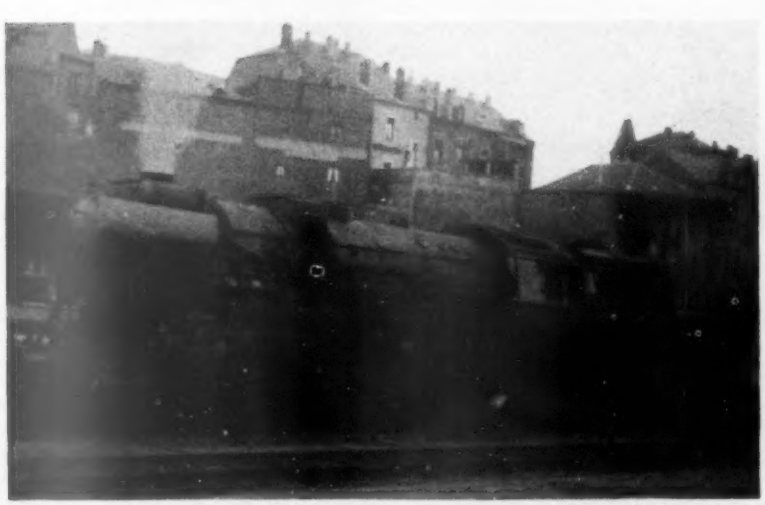
A smell of burning

Richard Trevithick began experimenting with model steam locomotives in 1787. His first attempt to harness steam power to a full-scale passenger-carrying vehicle was the *Puffing Devil*, a coach with seats arranged around the chimney. It made a successful trial run at Camborne in Cornwall on December 24, 1801, carrying, in addition to the invited guests, a horde of excited boys who clung to every available appendage. The *Devil's* progress at a good walking pace was described most ineptly by the assembled rustics as resembling that of a " little bird." On Boxing Day a second excursion was undertaken, but ended in disaster when the machine collapsed after traversing 300 yd. Trevithick and his friends sought solace in a nearby inn, while the steam car was hauled into the adjacent coach-house. Unfortunately nobody had remembered to extinguish the boiler fire; the boiler became dry, and the *Devil* red hot. When Trevithick, disturbed by the smell of burning, went to investigate, there was little that could be done either for the coach-house or the prodigious conveyance it had harboured.

South-west passage

A Bill has been deposited for the construction of a railway nearly 15 miles in length between Winchester and Southampton. The proposed line will commence in Winchester by a junction with the Didcot, Newbury and Southampton Railway, and will terminate in Southampton by a junction with the railway of the Southampton Harbour Board, after forming a second junction at Twyford with the Didcot Railway.—*From " The Financial Times " of January* 12, 1901.

STEAM WORKING IN LUXEMBOURG



Photo] [F. S. Middleton

Luxembourg National Railways 2-10-0 *locomotive of Series* " 56," *one of* 20 *supplied shortly after the last war by Belgian and French builders. These locomotives are employed on both goods and passenger duties*

OVERSEAS RAILWAY AFFAIRS

FROM OUR CORRESPONDENTS

QUEENSLAND

Burdekin Bridge construction

The Commissioner of Railways, Queensland, has invited tenders for the construction of a new bridge to carry the Mount Isa line over the Burdekin River at Macrossan near Charters Towers. It will be about 70 miles west of Townsville, North Queensland, and is estimated to cost some £A.1,000,000. The main spans, six in number, will be 250 ft. in length, and of the truss type, and there will also be 12 70-ft. through plate-girder spans. In the piers and abutments 7,720 cu. yd. of reinforced concrete will be required, and over 3,000 tons of structural steel will be used. For the foundations, 8,700 cu. yd. of excavation are envisaged and embankment construction will involve 145,000 cu. yd. of earthwork.

BRAZIL

Growing deficit of Federal Railways

The Federal Railways president, in a memorandum to the Minister of Finance, has reported that the total receipts of the holding company increased to 15,000 million cruzeiros in 1960, from 11,780 million in 1959, because of revised tariffs and increased traffic. The Federal Railways also received 13,600 million in government subsidies during the year. On the other hand, because of cruzeiro depreciation and salary increases, total expenditure rose to 33,500 million crs., made up of 20,300 million for staff payments (11,900 million in 1958) and 13,200 million for materials and services. Consequently, in addition to the budgetary allotments, already authorised, a supplement of over 4,900 million will be required to cover the deficit.

The Federal Railways estimate that receipts will be increased by 6,500 million crs. in 1961 due to the new classification of freights, which came into force on January 1, and further tariff adjustments.

ARGENTINA

Tenders for underground coaches

Buenos Aires Transport has decided to call for tenders for the supply of 90 underground railway coaches, principally for the new Plaza Mayo-Beedo line.

World Bank report

A preliminary report has been received from the team of World Bank experts who are at present studying the Argentine railway problem. They find that the present situation has arisen from (a) successive increases in salaries and wages, especially before 1955; (b) lack of capacity on the part of previous administrations; (c) labour impositions regarding working conditions; (d) lack of maintenance of locomotives, rolling stock, and installations; (e) the policy of subsidising certain of the services such as suburban passenger traffic, which is given at less than cost price; (f) inadequate parcels rates and the obligation to transport postal correspondence free; (g) the incapacity of the railways to keep pace with the country's increased productivity; and (h) low density of goods traffic, which in past years was compensated by an adequate rates structure, non-existent at present. These, state the experts, are only some of the causes, and the final report will doubtless reveal several others. On announcing these findings, the Minister of Public Works & Services, Eng. Constantini, stated that an increase of 30-40 per cent in goods rates and 100 per cent in passenger rates would be inevitable within a relatively short period.

UNITED STATES

Locomotives in service

Class I railways in the first nine months of 1960 placed in service 403 new locomotive units, all diesel electric except eight gas turbine electric. In the same period of 1959, 708 units were placed in service, including four gas turbine electric. New locomotive units on order on October 1 totalled 119, of which 41 are diesel electric, 12 are gas turbine electric, and 66 are electric. On October 1, 1959, 229 new locomotives were on order, of which 206 were diesel electric and 23 gas turbine electric units.

DENMARK

Private railway closures

At the end of March two privately-owned railways will close down entirely. They are the Ringkjobing - Ornhoj - Holstebro Railway, and the Naestved-Praesto-Mern Railway. The Ringkjobing-Ornhoj - Holstebro Railway in western Jutland has a route of 33 miles and is standard gauge. The railway owns two steam locomotives, two diesel locomotives, three railcars, seven passenger coaches, and nine goods wagons. The Naestved - Praesto - Mern Railway in south-east Zealand has 21 miles of route and is also standard gauge. The railway owns three steam locomotives and one diesel locomotive. It has four railcars, four passenger coaches, and 24 goods wagons.

DIESEL TRACTION IN RUSSIA

Photo] [J. O. Slezak

Co-Co+Co-Co diesel locomotive Class "TE3" at a recent industrial exhibition in Moscow

AUTOMATIC MARSHALLING YARDS

Methods being used, and results achieved in the automation of gravity marshalling yards operating under conditions applying to British Railways

by **J. C. KUBALE,** *Director & Manager, Associated Electrical Industries—GRS Limited*

THE VALUE of marshalling yards in the efficient operation of freight traffic has been appreciated for many years and the first improvement was the use of gravitation introduced towards the end of the last century. Points were manually operated and brakesmen employed to check wagon speeds, either by working the hand brakes or by the use of skids. The next step towards mechanisation was the power operation of points from a central position and the installation of retarders to displace the dangers accompanying manual braking. At the present time there are several countries which have large marshalling yards with centrally controlled power-operated points and retarders and although these functions are worked manually more efficient operation is obtained. In some of the later installations some of the most modern techniques of automatic control have been introduced.

Sorting sidings

The portion of a marshalling yard concerned with the sorting of freight trains extends from the reception lines, down an incline known as a hump and then to the sorting or marshalling sidings. On the arrival of a train in the sorting sidings it is uncoupled into single wagons or groups of wagons (called "cuts") according to destination. A cut list is prepared and the train is pushed slowly forward to the summit of the hump down which the single wagons or cuts travel, through points and retarders, towards the end of the track space available in the sorting sidings. In its journey from the hump summit to its destination in the siding, a wagon passes through several points, which determine its destination and also through retarders, regulating its speed in relation to other cuts, to reduce the possibility of overtaking. The process also has regard to its destination to ensure that it arrives there at not greater than the desired buffing speed.

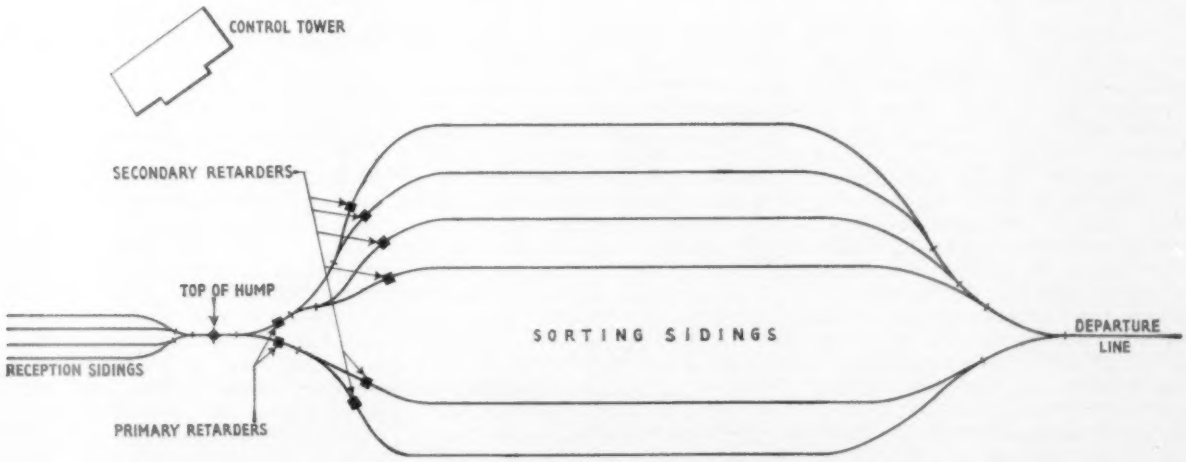
Centralised sidings

Centralised operation of power worked points in marshalling yards has been in use for many years together with track circuits to prevent them being moved while a wagon is travelling over them or is in close proximity. Some of these yards are at Banbury, Rogerstone, Mottram, and Severn Tunnel.

The object of installing retarders in the point area is to absorb the excess energy of wagons with a low rolling resistance and to release all wagons into their respective sidings at a speed which allows them to reach their destination at a safe buffing speed. In yards using primary and secondary retarders they are controlled so as to perform the subsidiary function of making the separation time between cuts or wagons of dissimilar running characteristics more uniform, thus making it less possible for wagons to overtake each other in the switching zone.

The principal reason for having multiple retarders is an economic one, as for every foot of retarder which is useful in the primary, an equal amount is saved from each secondary retarder to which it leads. In all countries the majority of mechanised yards have retarders manually controlled by operators in a centrally situated control tower. Sometimes the operator is informed of the total weight of each wagon and by observing how it is running, and from his knowledge of where it should travel in a siding, he releases it at a speed which he assesses by visual estimation. Wagon chasers are employed to apply the hand brakes on wagons in cases where they have received insufficient retardation. In these cases technical aid is essential if operating efficiency is to be improved.

Many methods to assist the work of the retarder operator have been tested and the most satisfactory means so far employed and one that is now in fairly general use, is the application of a short-wave electro-magnetic radiator and receiver to measure the speed of a wagon continuously during its approach to, and passage through, the retarder. This is sometimes termed Doppler Radar and by means of this equipment the speed of a wagon can be conveniently measured from the Doppler effect observed by comparing the frequencies of the wave transmitted from the radiating aerial and that of the reflected wave received back from the surface of the moving wagon. Such equipment was first used in Great Britain at Thornton Yard of Scottish Region, British Railways, to obtain automatic speed control of wagons from pre-selected release



Typical layout of hump shunting marshalling yard

D*

speeds for all primary and secondary retarders. Later at Temple Mills, Eastern Region, British Railways, for measurement of rollability and automatic speed control of the primary retarders. A later installation is at Margam Yard, Western Region, British Railways, for speed measurement and automatic retarder control. The operating functions which are to be included in a system of automation for the marshalling of wagons when they are ready to be moved from the reception sidings to the sorting sidings are, in order of sequence:

(1) The cut list giving the siding destinations of the cuts of wagons. This forms the humping programme for the train and must be delivered to the control centre.
(2) When humping commences the programme (1) has to be read and several successive items memorised as several cuts are in the switching zone at the same time.
(3) Each cut on the programme has to be weighed if this is not given on the cut list and its rolling characteristics determined as far as possible.
(4) Each cut has to be guided to its correct route as it proceeds from summit to siding.
(5) Each destination has to be measured to show how far the cut has to travel.
(6) Primary and secondary retarders have to be operated in such a manner that successive cuts do not overtake, and the release speeds from the secondary retarders must be such that the cuts reach their destination at a very low and safe buffing speed.

In a fairly busy yard an operator would be expected to deal with some 100 cuts an hr., or about 200,000 programmed items a year. Each cut has to be identified, its destination examined, its running characteristics found and its speed regulated. Even with the aid of automatic route setting, but without any aids to braking, an operator has to perform about 3,000 separate operations during each turn of duty in the marshalling of wagons. A miscalculation of any one of these would result in an error of performance which may require later correction even if it does not result in damage. When these operations are performed manually the work becomes dependent on intuition.

Wagon chasers

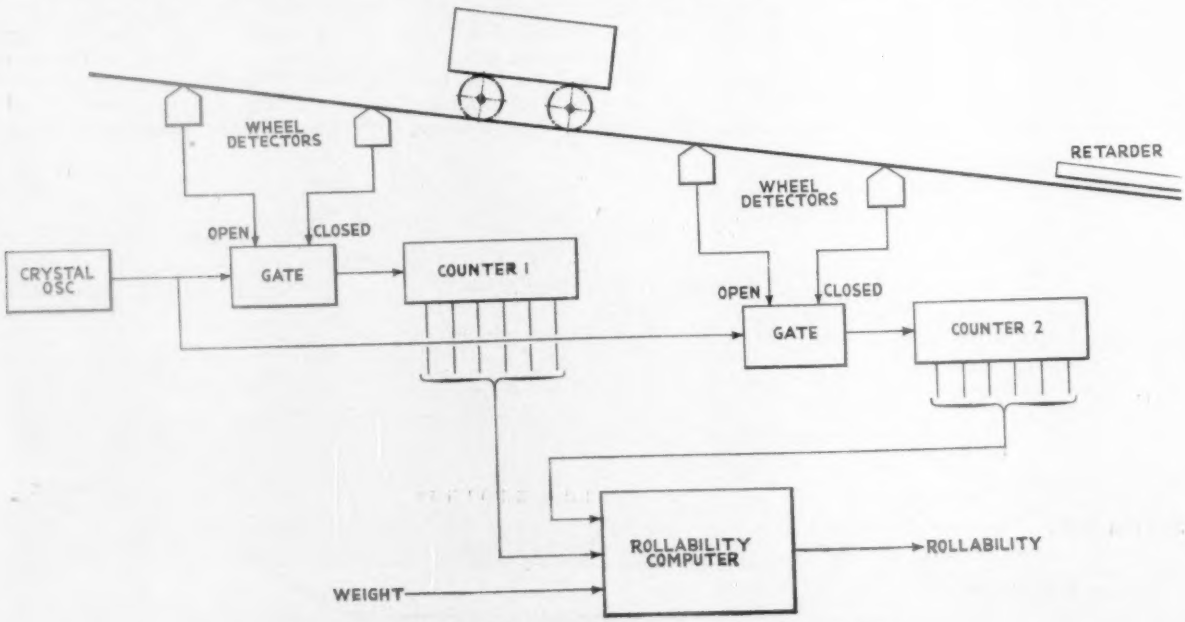
It is unreasonable to expect a very high degree of accuracy even from the best operators and in order to cater for the operator's error of judgment chasers are essential. These men do what they can to prevent collisions, when wagons are travelling too fast in the sidings. They are unable to take any action with retarded wagons which have stopped short and these have to be pushed up later by a locomotive which also corrects wrong shunts. Despite these difficulties, it should not be assumed that yard operation in the past has in all cases been of an inferior kind. With automatic route setting, manually controlled retarders, good operators and wagon chasers, with an efficient system of communication between the operators in the control tower, the hump engine driver and the chasers, many yards are capable of handling heavy traffic rapidly and with a low damage rate. The performance of these yards is entirely dependent on the quality of the manpower available and as it is now increasingly difficult to obtain suitable men, other means have to be found. These methods of automatic control, requiring the minimum of personnel, will now be considered.

Automatic control

The manner in which these are employed is the result of an appreciation of the overall operating requirements, a partial knowledge of the variations of wagon characteristics to be encountered and considerable prior experimentation and testing of equipment under conditions as nearly comparable as possible with the intended installations. Automatic operation can be partial or complete. In the former case some manual operations are retained, in the latter, they are not. The yards on British Railways employing automatic operation at the present time are, in order of their completion, Thornton Yard, Scottish Region; Temple Mills Yard, Eastern Region; and Margam Yard, Western Region. All these yards have automatic point operation. Thornton Yard employs automatic operation of primary and secondary retarders according to pre-set release speeds manually set by the retarder operator. Temple Mills Yard uses automatic control of the primary retarders only and manual control of the secondary retarders. Margam Yard uses automatic control of all retarders and is the only one of these yards which is fully automatic.

The basic functions of a fully automatic yard are:—

(1) The setting up of a cut list programme.
(2) The conversion of the programme into wagon route information for automatic point operation.
(3) A measurement of the state of occupation of sidings in the marshalling



Automatic retarder control equipment for measurement of rollability

yard before humping commences and a means of changing this information for each siding as wagons travel into them.

(4) A measurement of the axle loads from which the weight category of cuts can be determined, unless this has already been given in the cut list.

(5) A measurement of wagon rollability suitable for predicting the performance of a wagon or cut after it leaves the last retarder to its destination.

(6) A means of combining the results of (2), (3), (4) and (5) above and computing therefrom the desired speeds at which cuts should be released from the retarders.

(7) A means of measuring continuously the speed of a cut as it approaches and passes through a retarder.

(8) A retarder and control system capable of responding to the results of (6) and (7) above.

(9) A means of signalling to the humping locomotive to start and stop and at what speed it should push the wagons over the summit.

(10) Means of assuming manual control of points and retarders and thus overriding the automatic control of these when necessary.

These basic functions are provided in the following manner. The cut list programme originates from an examination of the wagon labels while the train is in the reception sidings, from where it is either transmitted to the central office directly or in some cases by radio transmission. Alternatively, the siding destination is chalked on the front of the wagons and read from them as the train is being pushed over the hump, and with this method the destination programme is prepared cut by cut as they pass the operator who reads the numbers.

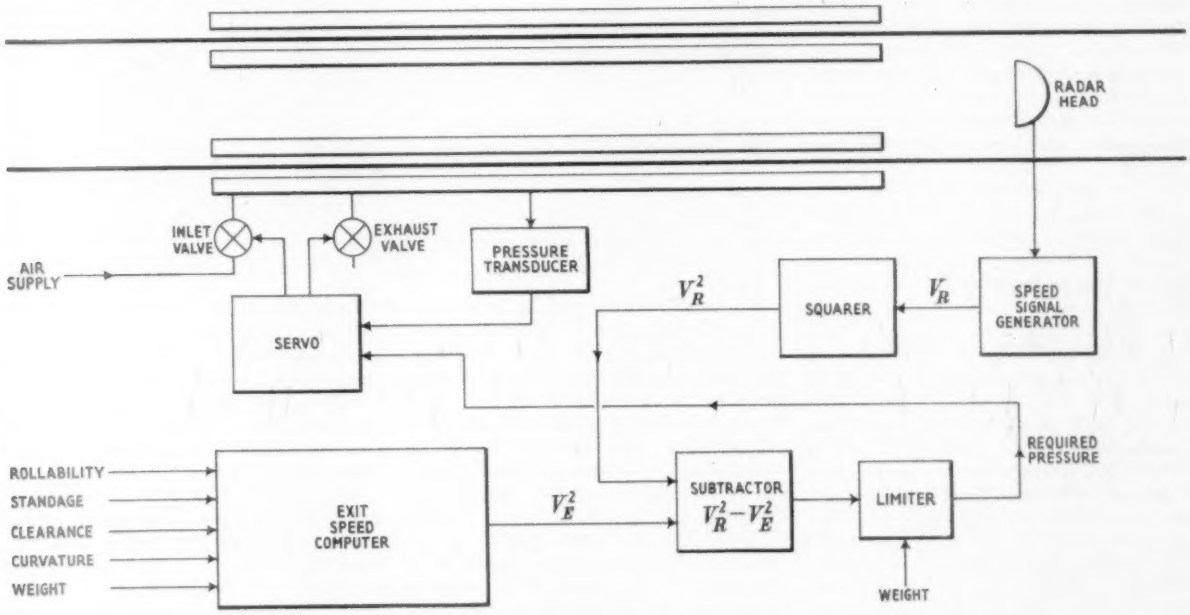
Train programme

By one method a cut list can be delivered to the control tower operator, who then sets up the programme by depressing appropriate buttons corresponding to the destinations. At Thornton Yard a whole programme for a train of 48 cuts can be stored before humping begins. At Margam Yard the cut list when received in the control tower is typed in a tele-typewriter and repeated to several offices, and at the same time a perforator prepares a paper tape. When a train has been selected for humping the tape for that train is placed in a reader which converts the teletype code into binary code suitable for feeding into the automatic point storage and setting relay network. The tape performs the programme store which with other methods require relay groups for this purpose.

The running distance into a siding is part of the total running distance of a wagon after the last retarder and one method of obtaining a measurement of this is to sub-divide the siding by means of track circuits and to subtract from the distance so given a definite length for each wagon which travels into the siding thereafter. The siding length can be corrected whenever a wagon fails to reach its destination.

The axleload is measured by inserting in the track a specially prepared section of rail having a slotted web and contacts to indicate load categories according to the amount of deflection of the rail.

Wagon rollability should include all factors which determine the free running characteristics of a wagon or cut and is dependent upon track curvature, wagon weight, journal and flange friction. Some of these factors are difficult to measure accurately and with sufficient assurance that the results are suitable for predicting the performance of a wagon throughout its travel from hump to siding destination. Tangent rollability gives the most reliable measurement for this purpose and can be measured in various ways as the wagon travels freely over a known section of track. One method is to measure the times taken to travel over given measuring sections and therefrom to calculate the change in energy of the wagon between the measuring sections, This is then used to compare the difference of energy with the difference of elevation of the measuring sections and to modify the result according to the wagon weight to cater for rotational energy, finally storing the result as an analogue voltage for use in the computer. Another method is to measure rollability on a known tangent track by differentiating the speed signal of a doppler radar observing the wagons over the measuring section and storing the result as an analogue voltage. Curvature rollability can be measured similarly over a measuring section of known curvature by either of the above methods. The number of places where rollability measurements are made is a matter for serious consideration. If a satisfactory measurement can be made between the hump and the first set of points only one measuring section



Automatic retarder control equipment for variation of exit speed

will be required for the whole yard and the results can be stored and passed forward to the primary and secondary retarder speed control systems. The alternative is to have rollability measurements made on the approach side of each retarder. By the former method the distance from the summit to the siding clearance points is greater than that required for the latter method and some increase in retarder capacity will be necessary on this account. The amount of instrumentation with the former is less than with the latter, although it can be considered an advantage to have what amounts to a separate rollability computer for each group of sidings in the latter method and thus again some increased insurance against systematic faults or complete failure of the measuring equipment. At Margam the latter system has been used. At Temple Mills two antennae are situated on the approach to the primary retarders. One of these measures the velocity of the wagon as it approaches the retarder and from which a rollability measurement is obtained, while the other measures the velocity of the wagon as it passes through the retarder.

At Margam, inductors on the approach to the retarders are used for rollability measurements. Similar groups of inductors are situated on the approach to the secondary retarders for the same purpose.

Determination of release speeds

The retarder release speeds are determined by analogue computers which consist of a combination of potentiometers and operational amplifiers which perform accurately and quickly the processes of addition, subtraction, multiplication and division, by which an equation of energy or motion of a wagon is solved. The release speed from the primary retarder is calculated to obtain approximately equal running times of single wagons to the secondary retarders and thus to reduce the possibility of wagons of different rollability overtaking one another. The release speed from the secondary retarders is calculated to allow wagons to travel to their destination and to arrive there at a safe buffing speed. This calculation must therefore include the losses of energy due to travel in the siding, and around any curves which may exist between the retarder and the tangent track, and the energy gained from any descending gradients. The resistance offered by curves, or the curvature rollability, can either be measured on a known curve for every wagon and the result used to obtain a factor assumed to be sufficiently accurate for calculating the energy losses of that wagon for all curves, or, alternatively, as the result of tests performed on the actual curves, a value of curvature resistance can be found and added to the other losses of energy for each siding. After all these factors have been fed into the computer a result is given in the form of a highly stabilised voltage as a measure of the energy a wagon or cut should have when it is released from the final retarder.

Comparison of speed

The retarder speed having been determined as the wagon is approaching a retarder, a means of comparing it with the actual wagon speed is required so that the proper retardation can be applied. The means employed is to direct a concentrated high-frequency electro-magnetic beam towards the wagon and to collect the reflection of this beam and to compare the frequencies of the transmitted and reflected signals. This is the Doppler Radar and it provides a continuous measurement of the wagon speed while the wagon is in the path of the beam. The transmitter and receiver form a single unit which is placed in the track and consists of a parabolic or horn-shaped antenna energised from a v.h.f. source. At Thornton Yard the frequency of the radar system is approximately 3,700 megacycles per sec. which gives a Doppler signal of 11 cycles per sec. per m.p.h. wagon speed. At Margam the frequency is 10,700 megacycles per sec. which gives a doppler signal of approximately 32 cycles per sec. per m.p.h. wagon speed.

The retarder control system consists of a unit into which is fed the information giving wagon speed as determined by the radar unit and the desired leaving speed which has been computed. The retarder is then applied at a pressure sufficient to accomplish the desired retardation. The maximum pressure which can be applied to a wagon is dependent upon the weight category into which it is placed by the weighing treadle, as in non-weight automatic retarders excessive retarder pressure can cause the wagons to ride out of the retarder and proceed unretarded. The control system must be sensitive, and capable of reducing the retarder pressure as the actual wagon speed approaches the leaving speed.

The humping speed of the pushing locomotive is not automatically controlled, but the speed at which the wagons pass over the hump summit is an important part of the overall operation. If wagons are pushed over too slowly obviously the humping operation will take longer than it should do. On the other hand, if wagons are pushed over too quickly it is possible for successive cuts to overtake before these have been correctly routed. A wrong shunt then results. The correction of wrong shunts can easily consume very much greater time than the apparent time saved by attempting to hump quickly, even if it does not result in damage. Means, therefore, are provided to indicate to the humping locomotive the speed at which it should push the wagons over the hump and this is done either by installing a fixed signal on the wayside or a signal in the locomotive cab. At Margam, cab signalling has been employed and a three-position indicator is placed in the cab of the locomotive, pick-up coils being placed over the running tracks at the ends of the locomotive. Audio-frequency signals are superimposed on the track circuit of the reception siding holding the train to be humped, and when the locomotive is attached to the end of this train it picks up from the track the speed signal which the operator in the tower has selected for that track. The principal signal in the driver's cab is a visual representation of a position light signal which would be placed on the wayside and which gives a continuous signal throughout the reception lines to the hump summit. An audible signal is also given to indicate any change of signal initiated by the yard operator in the control tower.

Protection against failure

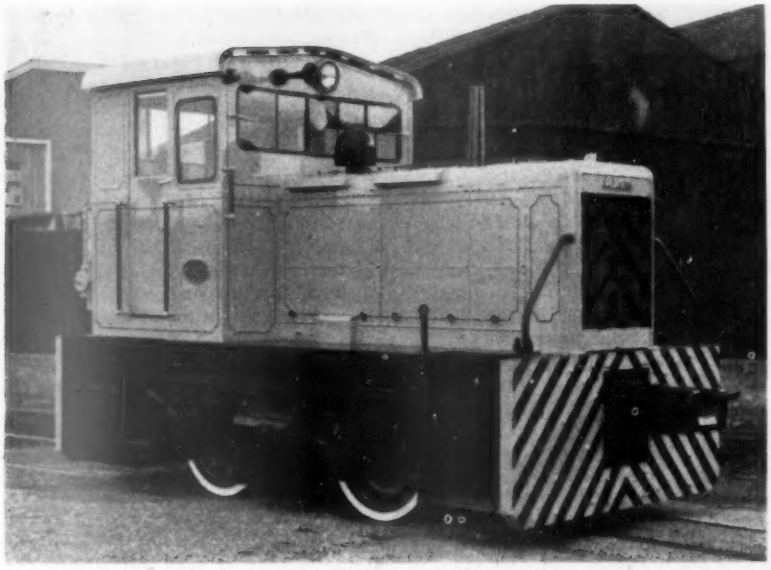
To allow for the possibility of failure of any of the automatic equipment and to allow an operator to assume an overriding control of points and retarders for any reason, the control panel situated in the control tower is equipped with switches and buttons to allow this to be done.

What has already been described are the methods of automatic control and the means employed for effecting them, from which it will be apparent that many variable quantities are concerned with the overall operation. The overall operating result depends upon the accuracy with which the performance of a wagon after it leaves the last retarder can be predicted from previous measurements. It is useless to measure quantities to a very small margin of error if the possibilities of prediction are subjected to a large margin of error. Experience so far indicates that with free-running wagons consistently good operation can be achieved, the result being that the time taken for pushing down wagons in the marshalling sidings, although this so far cannot be said to be eliminated, is considerably reduced, and with more consistent running and accurate control of the wagon speeds damages due to high speeds in the marshalling sidings have been greatly reduced. The principal difficulty encountered has been the performance of the wagon itself when it is found that wagons have dragging brake equipment or the brakes bind when the wagon passes round curves. No amount of automatic equipment of the type which has been described can ensure that these wagons are run sufficiently far into the marshalling sidings or even reach the clearance points.

Summarised from a paper read before the Institution of Railway Signal Engineers on January 11, 1961

SMALL DIESEL LOCOMOTIVES for Nigerian Industry

Variety of haulage duties by Planet four-wheel locomotives with hydraulic transmission



Planet LTC 25-ton diesel-hydraulic locomotive for shunting and haulage duties at a cement works

THE PRODUCTION of Planet locomotives for export markets during 1960 by F. C. Hibberd & Co. Ltd. of London, included a batch of six LC-TC 20-ton diesel-hydraulic four-wheel units and, on a different contract, three similar units of type LTC weighing 25 tons, all of 3-ft. 6-in. gauge for Nigeria. The value of both contracts totals just less than £100,000.

The first to be delivered were the six smaller units which were ordered by Richard Costain Limited in association with Raymond International (U.K.) Limited. These are powered by Dorman 6LC 152-b.h.p. engines and are in use for general haulage and shunting on a line specially constructed along the shore in connection with the building of a stone breakwater six miles long, and a separate island breakwater, in the Bight of Benin, Nigeria, to protect a dredged channel off the mouth of the Escravos river. The work, which is on behalf of the Nigerian Government, will take six years to complete and has necessitated the building of complete townships at Ore and Escravos; it is one of the largest civil engineering projects undertaken in the Commonwealth. The consulting engineers are Messrs. Coode & Partners.

The three 25-ton locomotives were ordered by Associated Portland Cement Limited for a new works, 40 miles north of Lagos, built on behalf of West African Portland Cement Limited. This is the first cement works in the western part of Nigeria; the area is one of very high relative humidity. One locomotive is in use hauling stores and shunting in the works. When the plant is in production this locomotive will assemble trains loaded with bagged cement for collection by Nigerian Railways. The other two will operate in the quarry, hauling trains of limestone and marl between the digging area and the crushing and washing plant.

Interchangeable components

Each of the locomotives for the cement works is specially equipped with a Leyland RE902 engine derated to 165-b.h.p. at site when running at 1,700 r.p.m. Although all three are of identical basic design, those for working in the quarry are equipped with couplers to suit 13-ton capacity side-tipping wagons supplied by Robert Hudson Limited; the other has A.B.C. couplers to enable it to handle Nigerian Railways stock. The necessary variation of about 1 ft. in the coupling centre-heights, for interchangeability of the locomotives, is allowed for by the use of detachable mounting plates on the headstocks. Additional holes are drilled to enable the British Railways design of buffing and drawgear to be substituted in case the locomotives are required to work in this country. For the same reason the axleboxes may be repositioned to simplify conversion to 4-ft. 8½-in. gauge.

Both the LC-TC and the LTC locomotives have frames of heavy deep-section rolled steel plate with construction for maximum rigidity under heavy shock loads. Transmission from the Twin Disc three-stage torque converter of the series 10,000 (sizes MS390 and MS470 respectively), to a spiral-bevel and spur reversing and reduction gearbox, is by Layrub 6-6 propeller shaft. Air operation of the reversing gears is interconnected so that it can occur only when the over-centre clutch incorporated in the torque converter is disengaged.

Maintenance simplified

Final drive from the transverse gearbox output shaft to the rear axle is by 2-in.-pitch triplex-roller chain; the same method of transmission is used to couple the two axles. All axle sprockets are steel castings split for ease of renewal. Axleboxes are of steel with gunmetal bearings in the top half and bolted rigidly to laminated springs which have renewable rubbing blocks on the frame. Simple and accurate setting of the final transmission is by adjustable - length radius rods mounted accessibly between the frame and axleboxes.

Braking on both versions is by Westinghouse compressed-air equipment operating on large shoes on all four wheels and a hand-screw control is interconnected to this. Sanding is of the air-operated four-box type. Driving controls are duplicated in the cab to allow for operation from either side. Instruments mounted in a flush desk include a water - temperature recorder. The roomy all-steel cabs have safety-glass screens and half-sliding windows which combine to give good all-round vision. Fuel tanks are of 40 gal. capacity and equipped with level gauge, also a semi-rotary lift pump and hose for filling from barrelled supplies.

Electrical equipment includes headlamps and red lights at both ends of the cab, controlled from a changeover switch, interior lights, and a heavy-duty 24-V. starter battery mounted accessibly and charged by a high capacity engine-driven generator. Both the LC-TC and LTC locomotives have wheelbases of 5 ft. 6 in., and are designed for easy working on a curve of 60 ft. radius.

SUSPENSION CHARACTERISTICS—1

The influence and action of damping

by J. L. KOFFMAN

THE GROWING appreciation that the function of suspension components should be clearly understood and that its elements should be designed to meet precisely defined requirements is causing a gradual change in the layout of bogies. In general terms, prevailing riding characteristics should be improved and the improvement maintained with minimum of attention between major overhauls. This means that springs should ensure the required force-deflection characteristics in terms of accelerations and displacement velocities, that the elements dealing with lateral displacements should not be affected by often uncontrolled or uncontrollable friction forces and that dampers should be used to provide the required oscillation damping forces in the vertical and lateral plane of the bolster suspension.

In detail, these requirements resulted in many new designs with which the leaf springs with their friction damping were replaced by helical, torsion bar, rubber, or air-spring units. As none of these so far can provide adequate damping, increasing use is made of hydraulic dampers which should meet the demand imposed in railway service (1). In the case of lateral suspension components, increasing use is made of assemblies incorporating swing links with " knife edge " ends. With these, friction is appreciably reduced and consequently use must be made of hydraulic dampers to control the amplitude of lateral oscillations. As these dampers, if correctly acting, are velocity-responsive, they will not provide the force required to check undue lateral displacement which can be encountered when running through a curve and here it might be necessary to use additional centring devices (2).

Road vehicle influence

So far as damper performance is concerned, many of the units fitted so far have characteristics unduly influenced by road vehicle practice. With this, road-holding is obviously a major requirement and this, coupled with the fact that the vertical excitation impulses are intermittent both in terms of frequency and magnitude, was mainly responsible for the use of dampers with unsymmetrical characteristics, the damping force at rebound (expansion) being two to three times as high as during the bump (closure) stroke (3).

In the 1934 edition of his book " Mechanical Vibrations," den Hartog states that " the theories and arguments given by the manufacturers as a justification of this practice do not seem to be quite rational." The same statement is repeated in the 1956 edition.

When it comes to railway vehicles it will be observed that both the vertical and lateral excitation impulses come at fairly regular intervals although the frequency and intensity is affected by the speed, vehicle design, and track conditions (4). Consequently, the dampers should have a symmetrical characteristic about the point of origin and the force-velocity dependence should be represented by a straight line up to the point of maximum damper displacement velocity likely to be encountered in service.

These simple facts, substantiated by fundamental considerations of elementary mechanics and fully appreciated by most vehicle designers and development engineers, tend to be occasionally overlooked by damper manufacturers, some of which cling to road vehicle practice throughout. Nevertheless, general agreement on this point is being rapidly reached, a factor which is appreciably simplifying the attainment of the desired vehicle performance characteristics.

Basic requirements

As mentioned previously (5), satisfactory riding qualities in the vertical plane demand to start with adequate static spring deflection, correct distribution of this deflection between primary and secondary system, and an overall damping of about D=0·25. As with primary laminated or helical springs the damping with conventional bogie designs is (and should be) frequently about D=0·4, that of the secondary system should be about D=0·2 to 0·25. These values include the unavoidable damping forces present in the system as a result of friction accounting for about D=0·02 to 0·05. In the lateral plane good riding qualities require a suitable matching of swing link length, spring base, wheel diameter, bogie wheelbase and centres (4), and a damping of about D=0·3 to 0·4. The very definition of D permits a straightforward determination of the characteristics of a hydraulic damper, provided the vehicle weight and its inertia about the relevant axis of rotation is known in addition to the spring and lateral control characteristics.

The simple calculations relating to the determination of the damping force expected of dampers dealing with body pitching and hunting are shown in Fig. 1. These relate to the bolster springs and lateral control only, assuming that both have linear force-displacement characteristics and hydraulic (viscous) dampers with which the force is proportional to displacement velocity.

The damper performance is calculated for pitching and nosing only, as these two modes are of great importance so far as the riding qualities are concerned. The resultant characteristics are plotted as solid lines up to the points of maximum displacement velocity. At higher velocities not likely to be encountered here the unloader valves should act, as the shape of the characteristic in this range is immaterial for this particular application. Even now, dampers with unsymmetrical characteristics acting during the rebound stroke and very little during the bump stop are frequently used. In the case of lateral oscillations, this is often the main reason why two dampers have to be used although a single damper with a symmetrical characteristic would be capable of dealing with the oscillations.

While the determination of the damper characteristics can be readily carried out with the aid of test rigs available to manufacturers, automobile builders, and railway administrations, the determination of the damping characteristics of a complete railway vehicle is more difficult. An effective way to do this is with the aid of a roller test rig which oscillates the vehicle over a wide range of frequencies, the damping being determined from the ratio of vehicle suspension component amplitudes/excitation amplitude. Such rigs are available to automobile manufacturers and research institutes and to at least three railway administrations.

Another method

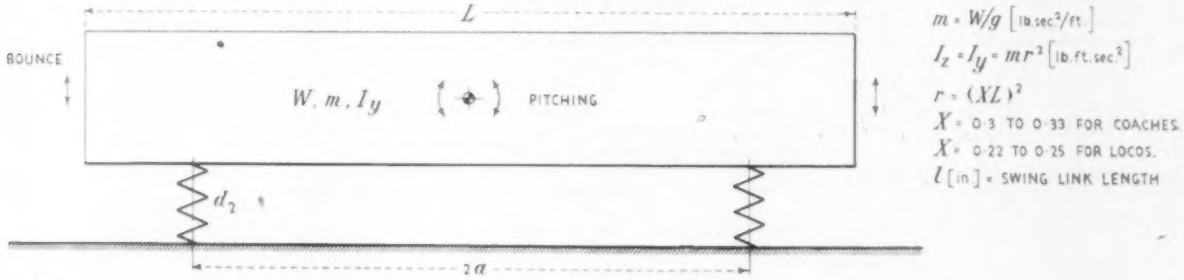
A simpler, though somewhat less precise, method is to excite the suspension system by the action of a single impact and to record the oscillation decay, the records being evaluated in terms of damping present in the system. The records are obtained by running the vehicle on to ¾-in. to 1-in. high wedges placed on the rails and then " dropping " it off the wedges. The resultant oscillations are evaluated from records obtained with the aid of mechanical vibrographs (1) or electric transducers. The damping factor D is obtained by reference to the curves (Fig. 2) as a function of the amplitude ratio of successive oscillations or on the basis of the number of oscillations to standstill.

A certain amount of friction damping is unavoidable, and this must be taken into account particularly as the curves

(Fig. 2) refer to the action of hydraulic damping only. The records can be analysed, provided they are suitable for more detailed treatment along the lines considered in (6) or use is made of an artifice indicated in Fig. 3. Here, the amplitudes of successive oscillations are plotted on semi-logarithmic paper and the resultant curve considered in terms of an equivalent straight line which on these co-ordinates is representative of decay resulting from hydraulic damping. The resultant, constant, amplitude ratio can now serve to determine D with the aid of the curve (Fig. 2).

This experimental determination of the damping appears to be rather simple and straightforward. Unfortunately, this is not always so. One major difficulty is to excite only one mode of motion (vibration at only one frequency) in the actual assembly. Frequently, the experimentally-obtained waveshape will show a combination of frequencies. This is especially true of the early portion of the wave. The second difficulty results from the assumption that damping is viscous. As this is frequently not the case, the values of the logarithmic decrement δ are likely to vary depending on the amplitude. Hence, the value of the damping factor D in the early part of the decay curve might differ from that obtained from the latter part.

It also should be mentioned that the amount of damping in ordinary mechani-


L
BOUNCE
W, m, Iy
PITCHING
d2
2a
m = W/g [lb.sec²/ft.]
Iz = Iy = mr² [lb.ft.sec²]
r = (XL)²
X = 0·3 TO 0·33 FOR COACHES
X = 0·22 TO 0·25 FOR LOCOS.
l [in.] = SWING LINK LENGTH
d2 [in.] = STATIC DEFLECTION
c2 [lb/ft.] = SPRING STIFFNESS OF BOLSTER (1 BOGIE)
cz [lb/ft.] = LATERAL CENTERING FORCE

Bouncing: $f_1=3{\cdot}13\sqrt{1/d_2}$ [c.p.s.]
Pitching: $f_2=(a/2\pi)\sqrt{c_2/I_y}$ [c.p.s.]
Nosing: $f_3=(a/2\pi)\sqrt{c_l/I_3}$ [c.p.s.]
For Bouncing: $D_1=p_1/\sqrt{2mc_2}$ [–] and $p_1=D_1\sqrt{2mc_2}$ [lb.]
For Pitching: $D_2=p_2a^2/2I_y2\pi f_2$ [–] and $p_2=4\pi D_2f_2I_y/a^2$ [lb.]
For Nosing: $D_3=p_3a^2/2I_z2\pi f_3$ [–] and $p_3=4\pi D_3f_3I_z/a^2$ [lb.]

EXAMPLE

Coach: $W=27$ [tons]; $2a=46{\cdot}5$ [*ft.*]; $L=64{\cdot}5$ [*ft.*]; $d_2=3{\cdot}5$ [*in.*]
$l=18$ [in.]; $m=1885$ [lb.sec.²/ft.]; $I_z=I_y=1885(0{\cdot}33\times64{\cdot}5)^2=850{,}000$ [lb.ft.sec.²]
$c_2=(27/3{\cdot}5)\times12\times2240=208{,}600$ [lb./ft.]; $c_l=27\times2240\times12/18=40{,}300$ [lb./ft.]
$f_1=3{\cdot}13\times\sqrt{1/3{\cdot}5}=1{\cdot}675$ [c.p.s.]; $f_2=(23{\cdot}25/6{\cdot}28)\sqrt{208{,}600/850{,}000}=1{\cdot}83$ [c.p.s.]
$f_3=(23{\cdot}25/6{\cdot}28)\sqrt{40{,}300/850{,}000}=0{\cdot}805$ [c.p.s.]
$p_2=2\pi(0{\cdot}25-0{\cdot}04)\times2\times1{\cdot}83\times850{,}000/23{\cdot}25^2=7550$ [lb.sec./ft.]
say 2,000 [lb.sec./ft.] for each damper (two per bogie)
From Fig. 3*b* Ref. 4 for Ride Index = 2·8, acceleration < 0·06*g*
Amplitude $a=b/(2\pi f)^2=23$ [in./sec.²]$/(2\pi\times1{\cdot}83)^2=0{\cdot}18$ say 0·2 [in.]
Velocity: $v_2=12$ [ft./min.]
$p_3=2\pi\times0{\cdot}4\times2\times850{,}000\times0{\cdot}805/540=12{,}700$ [lb.sec./ft.]
say 3,200 [lb.sec./ft.] for each damper (two per bogie)
Mean Displacement ±0·75 [in.], Velocity $v_3=23{\cdot}5$ [ft./min.]

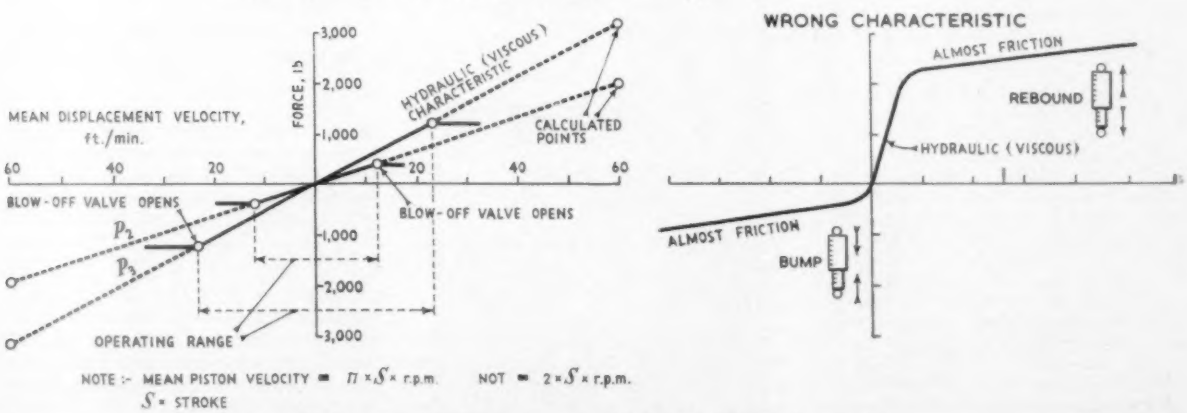


Fig. 1—Simplified determination of hydraulic damper characteristics

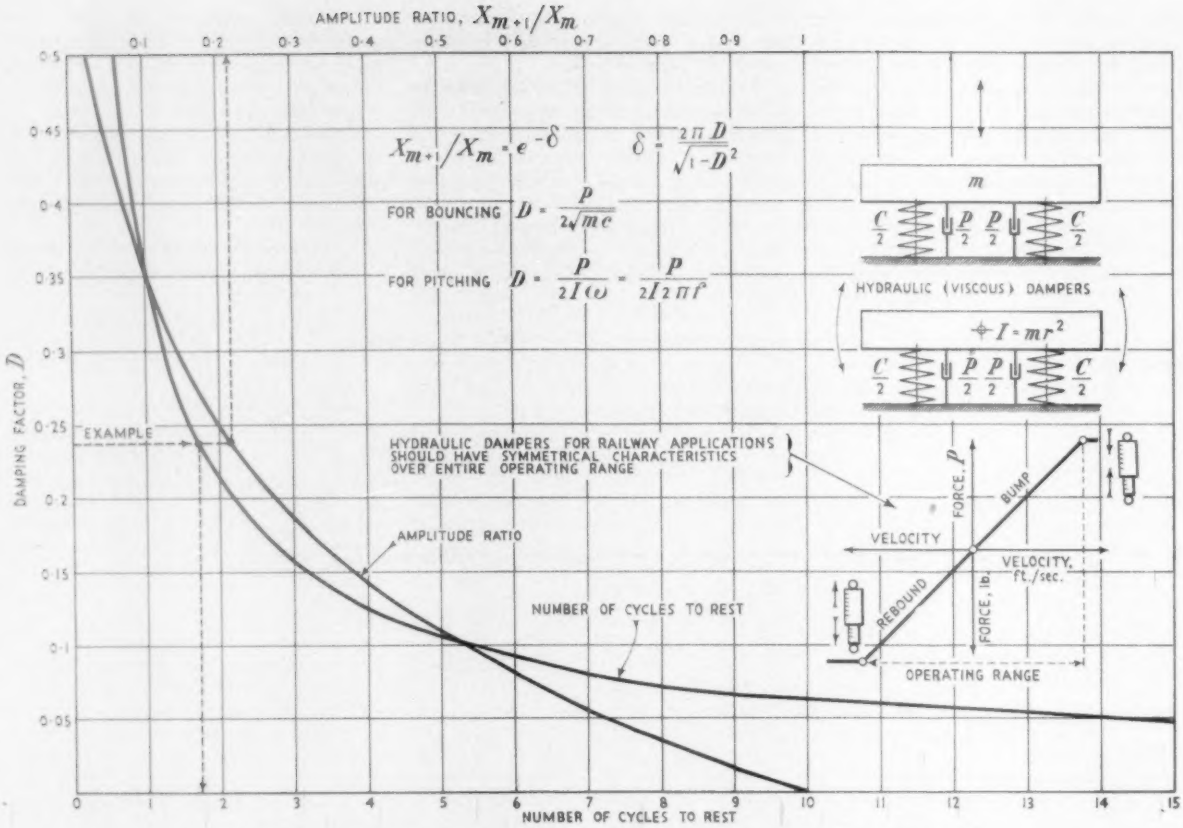


Fig. 2—Effect of damping factor on amplitude ratio and number of cycles to standstill

cal systems is difficult to estimate by observation alone. Most of the mechanical systems usually encountered have very little inherent damping. Thus, for a built-up steel structure such as a steel truss or platform, the damping is in the order of 0·03 of critical (D). With common rubber mountings as used to support I.C. engines, as well as for suspension elements, the damping will vary between 0·05 and 0·1 of the critical.

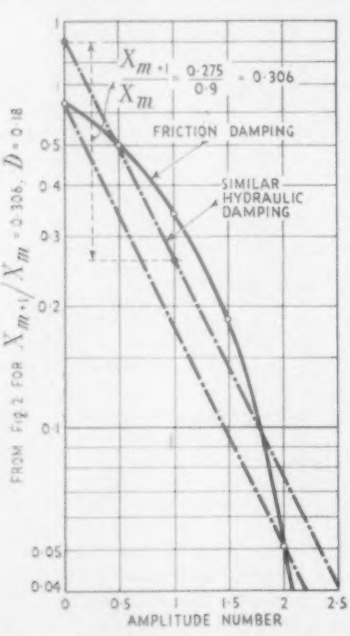

$X_{m+1}/X_m = 0{\cdot}275/0{\cdot}9 = 0{\cdot}306$
FRICTION DAMPING
SIMILAR HYDRAULIC DAMPING
FROM FIG. 2 FOR $X_{m+1}/X_m = 0{\cdot}306$, $D = 0{\cdot}18$
AMPLITUDE NUMBER

Fig. 3—Approximate evaluation of friction damping in terms of hydraulic damper characteristics

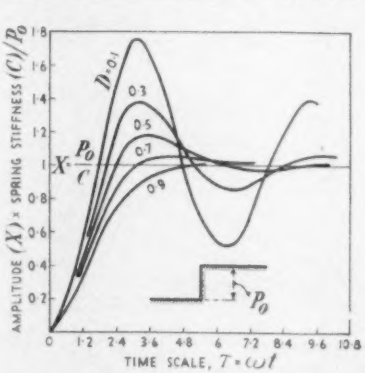


Fig. 4—Effect of hydraulic damping on pattern of oscillations caused by single impact

These and similar experiences accustom observers to the behaviour of systems with small damping. Consequently, noting the response of a moderately-damped system, such as a vehicle on its springs and hydraulic dampers, the damping appears to be very high. This general effect can be seen from the curves of Fig. 4, which shows the response of a one-degree-of-freedom system to a single impact displacement. The curve for 0·3 of critical damping gives the impression of being the response of a highly-damped system. The curve of 0·6 of critical damping, such as might be used for an instrument, gives the impression of being the response of a system with critical damping.

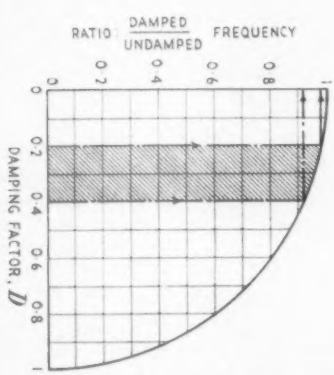


Fig. 5—Effect of damping on natural frequency of one-degree-of-freedom system

To be continued

PERSONAL

Overseas

MR. E. P. ROGAN, who, as recorded in our December 30 issue, has been appointed a Commissioner of the Victorian Government Railways, of Australia, joined that system in 1925 in the Transportation Branch as a junior clerk at Ballarat. He transferred to the Rolling Stock Branch two months later, and while serving with this branch, qualified as an accountant. He transferred to the Secretary's Branch, in 1933, and gained his Bachelor of Commerce Degree at the Mel-

bourne University a year later. He was appointed Industrial Advocate, in 1952, and became a member of the Staff Board in 1957. During 1960 he has attended the Summer School of Business Administration at Melbourne University.

SIR WILLIAM VAN HORNE, who is a Past President of the Canadian Pacific Railway Company, has been elected to membership of the Railroad Hall of Fame of Portland, Oregon. A certificate of award has been placed in the company's archives.

The Canadian National Railways has announced the following appointments: MR. M. R. MEUNIER, Assistant Director of Public Relations, is promoted to special duties in connection with the organisation of the St. Lawrence Region. He is succeeded by MR. T. AINSLIE KERR, Manager, News Services; MR. F. P. PHANEUF, Manager of the French Services has become Public Relations Manager, St. Lawrence Region. He is succeeded by MR. HENRI GUAVEL, formerly of the Department of Mines & Technical Surveys in Ottawa; MR. W. A. HOWARD, Supervisor of Press & Radio News, has become Manager, News Services; MR. R. H. AYRE, Supervisor of Film & T.V. Services has become Supervisor, Visual Design; MR. H. A. ETHERIDGE, Assignments, Editor, has become Supervisor of Radio & Television News; MR. J. M. MUIR, Staff Assistant, has become Supervisor of Special Events.

British Railways

MR. W. G. WOODYER, Stationmaster, Holborn Viaduct, British Railways, Southern Region, has been appointed Stationmaster, Cannon Street.

MR. R. ROBSON, Running & Maintenance Assistant, Traffic Manager's Office, Kings Cross, British Railways, Eastern Region, has been appointed Running & Maintenance Assistant, Line Traffic Manager's Office (Great Eastern), Liverpool Street.

MR. W. F. BEATTY, M.B.E., B.SC., F.R.I.B.A., M.I.C.E., New Works Officer, Euston, London Midland Region, British Railways, who has been appointed Assistant Civil Engineer, was educated at Royal Academical Institution, Belfast, and at Queens University, Belfast. Mr. Beatty joined the former London Midland & Scottish Railway, Northern Counties Committee, in 1930, as Engineering Assistant and transferred to the Civil Engineer's Department, L.M.S.R., in 1938. From 1938–44 he was in charge of the concrete depot, Newton Heath, and during this period acted as Resident Engineer in charge of the Direct Labour Organisation in the north of England. In 1944 he was appointed Assistant District Engineer, Blackburn, and, in 1945 moved to Watford in a similar capacity. He became Works Maintenance Assistant at Euston (1950), New Works Assistant (1951), Acting District Engineer, Crewe (1953), District Engineer, Crewe (1954), and New Works Officer, Euston (1959). Mr. Beatty was awarded an M.B.E. in 1950. He is a Fellow of the Permanent Way Institution.

MR. H. H. POWELL, Architect, British Railways, Eastern Region, who, as reported in our issue of January 6, was awarded the M.B.E. in the New Year Honours List, was born at Wallasey, Cheshire in 1906. He studied at Liverpool University under Professor Reiley and obtained his B.Arch. degree in 1928. After a period in private practice he began his railway career with the former London & North Eastern Railway, in the Office of the Chief Engineer (Southern Area), at Kings Cross, under SIR ROBERT INGLIS. He was appointed Regional Architect, Eastern Reg-

ion, in 1949, and has been directly concerned with the reconstruction of Potters Bar, Broxbourne & Hoddesdon, and Harlow New Town stations, and the new traffic offices at Cambridge and Doncaster. Mr. Powell was elected a Fellow of the Royal Institute of British Architects in 1954.

MR. L. J. SOANE, Assistant, Chief Civil Engineer's Office, Kings Cross, British Railways, Eastern Region, has been elected as an Associate Member of the Institution of Civil Engineers.

MR. M. M. LEVY, Assistant, Kings Cross Chief Civil Engineer's Office, has recently been elected as an Associate Member of the Institution of Civil Engineers.

MR. B. T. RANDALL, Assistant to Commercial Manager (Freight Rates & Charges), Eastern Region, British Railways, since 1957, who has retired, entered the service of the Great Northern Railway in 1915 in the Goods Manager's Office. In 1922, he was appointed Personal Clerk to the Assistant Goods Manager. In 1936, after experience in various sections of the rates office, he was selected as one of the staff for the newly-formed Research & Development Section of the Goods Manager's Department, Southern Area, L.N.E.R. For two

years during the war Mr. Randall was attached to the Chief General Manager's Office, L.N.E.R., after which he returned to the Goods Manager's Department as clerk in charge of the Works & General Sub-Section. Between 1949 and April, 1956, he successively held the appointments of Senior Clerk and Chief Clerk in the freight rates organisation of the Commercial Manager's Department.

MR. J. W. DICKINSON, Assistant Freight Officer (General) Traffic, British Transport Commission, who has been appointed Assistant to Commercial Officer (Freight Rates & Charges), Liverpool Street, British Railways, Eastern Region, began his railway career with the former London & North Eastern Railway in 1935. After war service he was appointed Traffic Apprentice, in 1947. Later he became Staff Clerk to the District Goods Manager, Hull, and afterwards Stationmaster, Ferryhill. In 1951 he became associated with traffic costing studies and became Assistant Traffic Costing Officer, British Transport Commission. He was appointed Assistant to the District Operating Superintendent, Euston, in 1954, and returned to the British Transport Commission, in 1956, as Assistant for freight development matters, the post subsequently being redesignated Assistant (Revenue). Two years later he took up the position he now vacates. Mr. Dickinson is Secretary of the Winter Transport Central Joint Conference and Joint Secretary of the Coastal Shipping Advisory Committee.

MR. G. S. LINDGREN, Chief Civil Engineer's Department, Kings Cross, British Railways, Eastern Region, on whom a Life Peerage has been conferred, as reported in our January 20 issue, commenced his railway career with the former Great Northern Railway in 1914. He was employed in the Chief Civil Engineer's Office, Kings Cross, in 1916, the District Engineer's Office, Derby, in 1919-20, and the District Engineer's Offices, Kings Cross and Stratford between 1920 and 1942. During the war years he was appointed Deputy Regional Commissioner, Civil Defence, West Midlands Area. In 1945 he was elected to Parliament as Labour Member for the Wellingborough Division. He was Parliamentary Secretary, Ministry of National In-

surance, 1945-46; Ministry of Civil Aviation, 1946-50; Ministry of Town & Country Planning, 1950-51, and Ministry of Local Government & Planning, 1951. He was an unsuccessful candidate in the 1959 General Election. Mr. Lindgren is a Justice of the Peace, a member of the Hertfordshire County Council, and Treasurer of the Transport Salaried Staffs' Association.

Industrial

MR. E. WATTS, Group Traffic Manager, Crosse & Blackwell Limited, who retired on December 31, joined the former Great Central Railway in the Portmaster's Department, Grimsby Docks, in 1910. After military service from 1914 to 1918, he returned to his railway appointment, which he left in 1928, to become Assistant Traffic Manager, Crosse & Blackwell Limited. Mr. Watts is a Member of the Institute of Transport and has the distinction of having been successful in passing the Associate Membership Examination at the first examinations held by the Institute in 1926. He is also a Fellow of the Industrial Transport Association. He is succeeded as Group Traffic Manager by MR. E. J. TRIGG.

MR. H. B. MORRIS, Secretary, Wickman Limited, has been appointed to the board of that company.

We regret to record the death, on January 6, of MR. A. E. BREARLEY, a former Chief Engineer of Anglo-Egyptian Oilfields Limited, and Shell Petroleum Co. Ltd.

MR. C. WHEELER has taken office as President of the British Iron & Steel Federation Limited, He succeeds MR. R. F. SUMMERS. SIR JULIAN PODE will be President-Elect during 1961.

DR. T. VON KARMAN (U.S.A.) has been awarded the 1961 James Watt International Medal by the Council of the Institution of Mechanical Engineers. It is hoped that the presentation of the medal will take place at a meeting of the Institution later in the year.

MR. H. N. EDWARDS, Chairman of the Metropolitan-Cammell Carriage & Wagon Co. Ltd. and the Railway Carriage & Wagon Building Association, has relinquished the latter position at his own request. MR. D. J. C. ROBERTSON has been elected to fill the vacancy.

The following executives of Crofts (Engineers) Limited have been appointed sectional directors of that company: MR. H. GOLDTHORPE to be Works Director; MR. C. MASON to be Branch Works Director; MR. A. HEARN to be Production Control Director, and MR. S. W. BALL to be Foundry Control Director.

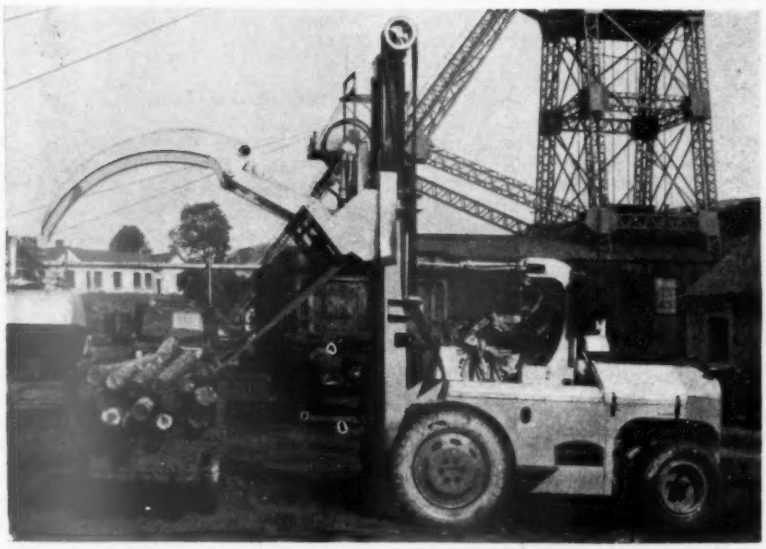
The following organisational changes have been announced by the General Railway Signal Company: MR. JOHN W. PORTER, Vice-President in charge of sales, to be Executive Vice-President; MR. LOUIS T. FREED, Western Manager, to be Sales Manager in charge of United States & Canadian Sales; MR. HOWARD C. PALMER, Assistant, Western Manager, to be Western Manager.

MR. W. F. BROOKS is relinquishing his position as Secretary of British Electric Traction Co. Ltd. to take up an executive appointment with Rediffusion Limited. He will be appointed to the boards of a number of companies in the Rediffusion group. MR. NEVILLE SMITH, Secretary of Rediffusion Limited, has been appointed Secretary of British Electric Traction Co. Ltd., in succession to Mr. W. F. Brooks. MR. D. A. SMITH, Chief Assistant, British Electric Traction Co. Ltd., Secretariat, will succeed Mr. Neville Smith as Secretary of Rediffusion Limited.

Erratum

MR. J. W. S. PEGRUM, General Manager, Rhodesia Railways, took up that position, in January, 1958, and not, as recorded in our December 9 and January 13 issues, in August, 1957, which was the date on which the announcement of his appointment was made.

NEW EQUIPMENT *and Processes*



FORK-LIFT TRUCKS

Matbro Series III Fork-Lift trucks are now available for export to overseas markets. They are suitable for handling a wide variety of loads in railway sidings and goods sheds, warehouses, and docks. They are designed for operation on smooth floors inside buildings, or equally well out of doors on rough, unmade surfaces.

The series covers five types with load capacities ranging from 4,000 to 10,000 lb. The largest of the series, Type 100, is powered by a Fordson 4D 62-b.h.p. diesel engine; alternative engines for either petrol or low-pressure gas may be used as desired. A choice of transmissions is available, either a conventional dry plate clutch, and manual gear-change, or a torque converter with power gear-change.

The lifting fork is actuated by a hydraulic ram, supplied by a gear-type pump direct-coupled to the engine. The mast assembly is of high-tensile steel pressings, and replaceable phosphor-bronze rubbing strips are fitted. A special attachment is available for handling loads such as pit-props and cable drums. This is in the form of a curved claw which holds the load securely on the fork and may be released by the driver when unloading as shown in the illustration.

Steering is by means of the hydraulic-power, axle-centre pivoted, Ackerman system, and a turning radius of 122 in. facilitates manoeuvring in a confined space. Brakes are of the Girling mechanical type, and act on the reduction shaft.

The maximum road speed is 11 m.p.h. forward and 6 m.p.h. reverse, and the maximum gradient that can be negotiated fully loaded is 1 in 10. The unladen weight of the vehicle in working order is 13,000 lb.

Further details of the complete range of Series III trucks may be obtained from Matbro Limited, Matbro Works, Horley, Surrey.

AUTOMATIC AIR BRAKE

The DAKO-CV air brake has been developed primarily for the Czechoslovak State Railways as a contribution towards the safety and ease of maintenance of rolling-stock. Its design is simple, so that, for instance, the distributor can be altered readily, and it can be used on passenger coaches or goods wagons. Having satisfied U.I.C. test requirements, it is being fitted to all Czechoslovak rolling-stock in these categories, and is recognised for international use.

The braking system is of an advanced automatic type, with a high percussion velocity, good resistance to overloading, short release time, and reliability in respect of not becoming exhausted.

Braking is claimed to be smooth even at very low speed. The smooth braking is due to a percussion velocity of 288 mm. per sec., and to an ample development of pressure in the brake cylinders on wagons even at the rear of a very long train.

Smooth action is possible also if it is necessary to release the brakes hard on previously stopping, as the accelerating mechanism of the distributor operates instantaneously as from the moment the pressure in the brake cylinder is lower than 0·2 atm. The percussion velocity then has about the same value as if braking were carried out at a working pressure of 5 atm. Apart from this, equal lowering of the pressure in the running piping contributes to smoothness. Complete braking occurs when there is a pressure of 3·5 atm. in the piping. The brake release time for passenger and goods trains is short and does not substantially differ from the highest limit prescribed for release on an individual coach or wagon. On a passenger train with 80 braked axles, a release time of 20·5-21·6 sec. has been recorded (after complete braking). The full release on a test goods train with 150 axles, three-quarters of which were braked in the "loaded" position, occupied 56-60 sec.

Full release of individual distributors occurs at the moment when pressure is raised to 4·84 atm., which is 0·16 atm. less than the initial pressure before braking.

Tests for inexhaustibility in use on goods as well as passenger trains have shown the new brake to satisfy all U.I.C. conditions. On a goods train, only 0·7 per cent exhaustion was measured, and on a passenger train 0·8 per cent; a brake is classified as inexhaustible if exhaustion does not exceed 15 per cent. Overloading is met by the strength of the brake. On a goods train with 150 braked axles the continual lowering of pressure from 6 atm., in all operative parts, to the normal 5 atm. took only 4 min. 56 sec., while on a passenger train with 80 braked axles it took 4 min. 28 sec.

The DAKO-CV distributor is simple to produce and has few parts, so that maintenance of the brake is easy. Individual components are light, accessible, and interchangeable. The distributor has no slides, piston rings, or leather washers, but valves with a packing of hard rubber, pistons with rubber diaphragms and rubber washers. It can be readily adjusted to all sizes of brake cylinder by an arrangement of calibrated throttle holes. It is small in size and of light weight; in cast iron, it weighs about 57 lb.

The layout of the pneumatic and mechanical sections of the brake equipment does not differ from that normal to most railway coaches or wagons. Where it is necessary to vary pressures of the brake shoe according to weights of

load carried, a special valve eliminates the need for other systems of braking on goods wagons.

Alteration in pressure is carried out pneumatically, and the required maximum air pressure in the brake cylinder is ensured by a hand regulator with two or more settings—for operation by degrees or automatically and continuously. Automatic control of the pressure of the brake shoes according to weight of load can be derived from the loading of the springs in the body of the wagon.

The supplementary valve is small. It is fitted to the distributor by flanges and connected with an auxiliary air reservoir, to form a compact unit. The main air reservoir has a capacity of 2·5 l and functions as a brake cylinder with a constant stroke. It is carried under the wagon and is connected with the distributor by a short steel pipe. The maximum pressures in the cylinders of the valve are 1·3 atm. and 3·8 atm. This is considered by the manufacturer to be suitable even for the braking of light wagons carrying heavy loads. The filling and emptying times of the cylinders are uniform and do not depend on the stroke.

Further details may be obtained from the Kovolis National Corporation, Hedvikov, Czechoslovakia.

rating of 6 A. at 110 V. d.c., is of mercury-tube pattern with both electrodes in one end only. This tube snaps through 90 deg. at the operating level, ensuring that the mercury is either in contact with the electrodes or, alternatively, at the other end of the tube. Thus it cannot splash over and give intermittent contact. In addition the differential between the trip and recovery levels is kept as large as possible so that water surge caused by vehicle movements will not cause intermittent operation.

The front cover, which contains the dial chamber, is removable for wiring purposes. Since the pointer itself is a magnet it automatically picks up the correct reading when this cover is replaced.

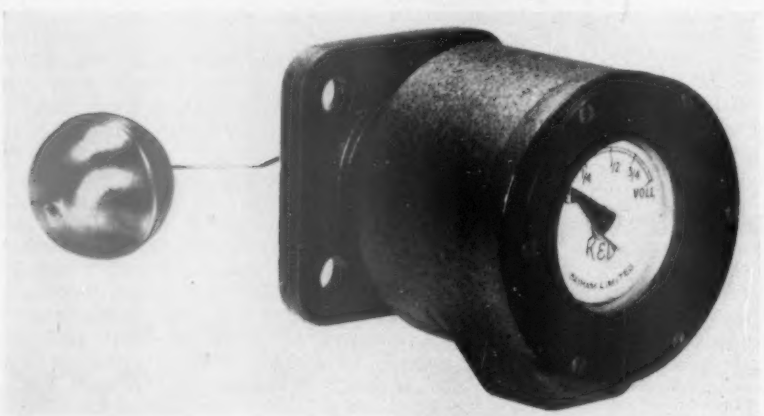
Further details may be obtained from Bayham Limited, 12, Lower Grosvenor Place, London, S.W.1.

PLASTICS REINFORCEMENTS

A complete range of plastics reinforcements in low-alkali " E " glass is available from Glass Yarns & Deeside Fabrics Limited.

Full-scale production has begun on chopped strand mats suitable for contact mouldings, press moulding, or translucent panels, and rovings for pre-form machines, glass/resin depositors, weaving, and pipe winding. These products are additional to Deeglas mats and rovings in A-glass filament, which continue in production.

Further details may be obtained from Glass Yarns & Deeside Fabrics Limited, 9, Kingsway, London, W.C.2.



LEVEL GAUGE
with Alarm Switch

Primarily designed for use in cooling-water header tanks on diesel locomotives, the R. & G. Type 1810 gauge switch gives both a continuous pointer indication of water level, and an alarm contact at low level. It can also be used in daily-service fuel tanks and, in the case of electric locomotives, on transformer tanks to indicate the oil level.

Both operations are magnetically controlled by the movement of the float arm: the pointer by magnetic attraction to give sensitive indication; and the switch by repulsion which in turn gives a snap-over and positive locking action.

The switch itself, which has a standard

ELECTRO-HYDRAULIC
Tension Cell

An electro-hydraulic tension cell with in-built pressure transducer has been developed which is claimed to be particularly suitable for crane-weighing applications, where it would give advance warning of overloading on the crane boom. The cell can be built into the crane structure, thus avoiding the problem of cable-reeling.

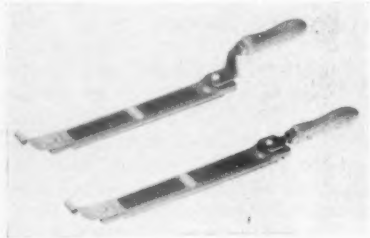
Requiring a mains supply only, this robust, non-electronic cell provides a simple two-unit remote-indicating system. No amplifiers or power units are needed.

Further details can be obtained from Salford Electrical Instruments Limited, Magnet House, Kingsway, London, W.C.2.

INDUSTRIAL FILE

The Surform industrial tool, with newly designed 10-in. perforated blade of hardened and tempered Firth-Cleveland tool steel, has been developed to cut, smooth, shape, and trim mild steel, most non-ferrous metals, and other hard materials without impaired efficiency during long periods of continuous use. It is claimed to be equally effective in cutting wood, leather, plastics, hard rubber, hardboard, and fibrous materials.

The blade, type 638, is coloured blue for quick identification of its high-speed qualities when compared with somewhat similar designs used in existing ranges of Surform household tools. Its working surface has numerous non-clogging,



ground positive-angle cutting edges set further back than hitherto in relation to the blade corrugations to control the depth of cut especially when used on curved and irregular surfaces.

The whole design of the industrial tool has been evolved after prolonged and careful study of general engineering requirements; several features make it suitable for an entirely different range of applications particularly where rapid production work is required. Exhaustive tests have been carried out to prove its ability to accelerate such work as finishing welds on aluminium alloys, fettling non-ferrous castings, roughing-out mild-steel components, and cleaning mild-steel bearing backs. Only light pressure is needed for filing operations.

The body is of steel construction with removable forward guide and slotted blade-tensioner. Industrial tool No. 150 has a straight wood handle and No. 151 has a cranked handle which is adjustable laterally through 360 deg. with positive locating studs.

Further details may be obtained from Firth Cleveland Tools Limited, 7, Cleveland Row, London, S.W.1.

Ministry of Transport Accident Report

Newcastle Central Station, July 25, 1960, British Railways, North Eastern Region

Colonel W. P. Reed, Inspecting Officer of Railways, Ministry of Transport, inquired into the collision which occurred at about 11.29 a.m. on July 25, 1960, at Newcastle Central Station. On a fine but overcast day, the driver of an unfitted freight train passed a colour-light signal at danger, and collided sidelong with the 11.26 a.m. Newcastle to Leeds passenger train, which was converging on to the same route. Speeds were low, and the damage was not serious, though the first two coaches of the Leeds train were derailed. Three of the 200 passengers complained of shock, but did not require medical treatment. The up and down south lines were blocked by the derailed coaches, but were restored to traffic by 9 p.m.

The freight train consisted of 13 empty oil tank wagons, with two runner wagons at each end and a brake-van in rear. It was drawn by a 4-6-0 Class "B-16" steam locomotive. The driver's position was on the left. The passenger train consisted of seven coaches fitted with buckeye couplings, and was drawn by a Type "2," Bo-Bo, diesel-electric locomotive.

The collision occurred on the approach to King Edward bridge, beyond the south-west end of the station. Immediately outside the station there is a complex network of lines, where the route to the south diverges from the route to Carlisle. On emerging from this network, there are four lines to the south, leading across King Edward bridge. These lines are known, from left to right looking away from the station, as Up East, Down East, Up South, and Down South. They proceed along a fairly sharp left-handed curve.

For a short distance towards the bridge the last three of these lines are signalled for both-ways working. There are a number of connections and cross-overs between all four lines on the approach to the bridge, and these serve to sort the traffic out into its final directional order of one-way working, whether up or down. It was while passing over one of the cross-overs from down south to up south that the passenger train was hit by the freight train which was proceeding out of the network along the up south line.

Central control

The whole of the Newcastle area is equipped with three-aspect, searchlight-type, colour-light signals with an additional lamp for the double-yellow aspect where appropriate, and also with electro-pneumatic point-operating equipment. Everything is controlled from a central, route-relay interlocking installation in a new signalbox at the station which was brought into use in 1958. There is a general speed restriction in the area of 15 m.p.h.

On leaving No. 10 platform, which is one of the three through platforms, the freight train first received a yellow at No. 159 signal. Eighty yards ahead, at the entrance to the network, this train had another yellow from signal 169, and though the driver said he had no route indication, the theatre-type route indicator at this signal showed the letter "S" for the up south line. One-hundred-and-forty yards further on, in the middle of the cross-overs on the approach to King Edward bridge, there is a gantry carrying one out-going signal for each of the four lines, and on its other side incoming signals for the down east, up south, and down south lines. The signal for the up south line, along which the freight train was proceeding, showed red. This was signal No. 179.

The passenger train started from No. 12 bay platform on the other side of the station. As the front of this train was standing on the track circuit beyond the platform starting signal No. 187, only a subsidiary signal could be given it, but it was correctly authorised to start by the platform inspector. Sixty yards ahead it came to signal No. 195, on the same gantry as signal No. 169. This showed yellow, and its route indicator showed the letter "D" for the down south line. One-hundred-and-forty yards ahead it came to signal No. 181, on the same gantry as signal No. 179. Evidence showed that by the time the passenger train reached this signal, its howed green with a route indication "S" for up south.

After passing signal No. 181 on the down south line, there are two alternative cross-overs to take a train on to the up south

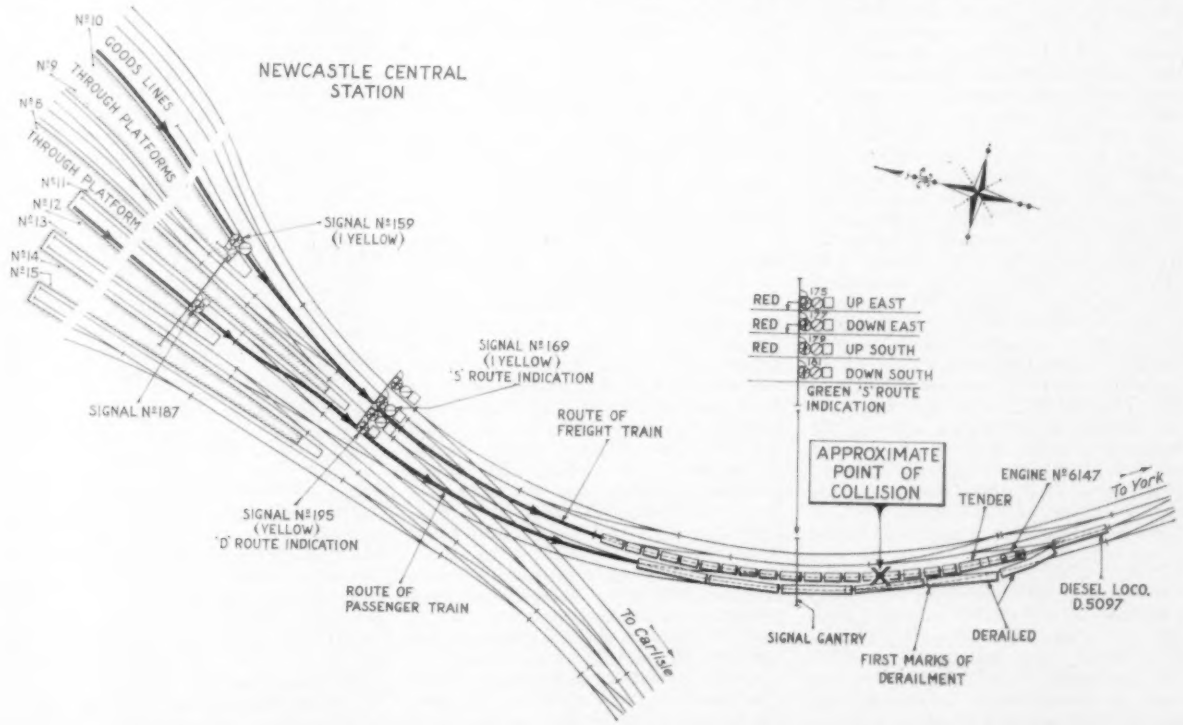


Diagram showing circumstances of accident at Newcastle Central Station, British Railways, North Eastern Region

E

line. One lies immediately ahead of signals 179 and 181, the fouling point being only 20 yards beyond the signals. The other one lies 80 yards further on. The signalman had routed the passenger train to proceed over the nearer cross-over.

The signalman operating this section of the panel said that it was not unusual to allow simultaneous movements of trains outwards along the up south and down south lines. When asked why he had not held the freight train at signal No. 169 until the route ahead of No. 179 had become clear, he said that he had allowed the freight train to proceed up to No. 179 because he understood that the traffic regulator required No. 10 platform.

Passenger driver's evidence

The driver of the passenger train said that he saw signal No. 195 at yellow with a "D" indication. A few moments later he saw signal No. 181 at green with an "S" indication, as the signal came into view beyond the slowly moving freight train on the inside of the curve. He said he was momentarily concerned whether the freight train on the adjacent line would stop, though he estimated its speed at only 6 to 7 m.p.h., and he checked the acceleration of his own train. As he was travelling over the cross-over ahead of signal No. 181, he felt a heavy drag, and at once shut off power and applied the brake. His train travelled about 35 to 40 yards after the collision occurred.

The driver of the freight train said that he had been stopped at No. 159 signal for four minutes before being given a single yellow. After having started, the next signal (No. 169) showed a single yellow with no route indication. "I then," he said, "caught sight of a green with an "S" route indication. I notched up, had a look at my watch, and I remember it was exactly 11.30 a.m. When I looked out again I was nearly on top of the next signal (No. 179). I saw it at red and I realised that I had misread the gantry. I immediately shut off steam and made a full brake application, but could not avoid the collision."

He estimated his speed to have been less than 10 m.p.h. He said that he had been stopped before at this signal, and so was not expecting it, as of habit, to clear for him. He knew that the signals on the gantry were difficult to see because of the curved approach, but did not consider this to be an excuse. He reaffirmed, when questioned, that on this occasion, his eye was attracted by the illuminated "S" indication above No. 181 signal and that he wrongly assumed it to be the signal for his line. He was aware that if he had continued to look out he would, after travelling a short distance beyond signal No. 169, have seen the aspects both of his signal (No. 179) and of signals No. 175 and 177 applying to the two "east" lines on his left; but he admitted that he relaxed his vigilance while he adjusted the controls on his engine and looked at his watch.

No route indication

He was sure that there had been no route indication above signal No. 169, though there should have been the letter "S." His recollection of the signal aspects and route indications which he saw on his approach to Newcastle were also at variance in certain details with what should have been presented to his view as his train ran into No. 10 platform. Tests carried out after the accident showed that the signalling was in perfect order, so it is probable that his recollection was at fault in these details. This had no bearing on the accident. He did not criticise the signalling except to suggest, when asked, that No. 179 might be re-aimed so that it came into full view rather sooner.

The fireman of the freight train had nothing to add to the driver's evidence. The guard confirmed that signal No. 179 was at red as the engine of his train passed it. He did not have time to apply his handbrake before the collision.

Because of the short over-run beyond signal No. 179 to the fouling point, Colonel Reed questioned the North Eastern Region Operating Officer about the advisability of allowing trains, particularly unfitted freight trains, to draw up to this signal when the route ahead is obstructed. This kind of movement is permitted at a number of converging junctions in the Newcastle area, and was questioned by Colonel McMullen and Colonel Reed when they inspected the new signalling in 1959. They were informed that because of the great frequency of train and engine movements and because of the constricted space between the junctions at either end of Newcastle Central it was necessary, for efficient operating, to allow train movements up to such signals. It was accepted then that this was not unsafe in a colour-light area and in view of the 15 m.p.h. speed restriction. The Operating Officer reaffirmed that the existing signalling facilities for outgoing trains to draw up at slow speed to junction signals were still necessary to avoid serious delays.

Tests made after the accident showed that with a train of similar composition to the one involved it was possible to stop it in 42 yd. from a speed of 15 m.p.h., and with a full load of 45 wagons plus a brake-van it took 58 yd.

Inspecting Officer's conclusions

Colonel Reed is satisfied that both trains were correctly signalled away, and that signal No. 169 was properly at yellow and No. 179 at red while the freight train approached them. The driver in charge of the passenger train was evidently alert. His momentary doubt as to whether the freight train would stop was not so strong that he felt it necessary to stop his own train, and Colonel Reed does not hold him to blame in any way.

There is no doubt that the accident happened because the driver of the freight train misread the signals when he saw them from a point outside their beam. His attention was attracted to the illuminated indicator above the signal next to the one for his line and he carelessly assumed that that signal applied to him. He then ceased to pay attention to the signals as his train travelled to a part of the curve where he was in the direct beam of each of the four signals on the gantry. Had he continued to watch them, as he should have done, Colonel Reed is sure that he would have realised his mistake in time to stop the train before reaching signal No. 179.

Colonel Reed believes that if these four signals had been fully visible to the freight-train driver when he was passing signal No. 169, he would not have been misled by the illumination of the indicator above No. 181. The adjustment of signals on curved track so as to provide the most satisfactory view from an approaching train is often difficult with the standard narrow-beam focusing which is the best when the approach is on more or less straight track. The beam can be widened a little by varying the focusing; alternatively spread-light lenses can be provided. The range of view for these lenses is naturally limited, but the angle to both sides of the axis from which a good view can be obtained at medium or short range is very much greater. They are therefore suitable for use in some places where approaches are curved and speeds are not high. The disadvantage is that the spread beam, if applied to a number of signals in a congested area, can cause a confusion of lights.

Signal-sighting committee

After the accident a signal-sighting committee was convened by the Railway to consider the application of spread-light lenses to these four signals and others in similar conditions at Newcastle. In consequence spread-light lenses have been fitted to these four signals and to three others as well. The viewing of four other signals has been improved by minor adjustments in focusing.

While Colonel Reed does not hold that the short over-run from signal No. 179 to the fouling point was a contributory cause of the accident, he says that as a matter of principle a movement up to a junction where the over-run beyond the protecting signal is short should not be signalled when a conflicting movement is taking place over the junction unless it is really necessary. In this instance, if the passenger train had been routed over the second of the two cross-overs in advance of signal No. 181, the over-run beyond signal No. 179 would have been satisfactory. This alternative route could have been set, and he suggests that consideration be given to instructing signalmen to use it in preference to the other one whenever the circumstances permit.

Withdrawal of electric rolling stock

A number of electric locomotives and multiple-unit trains operating on the Manchester-Crewe line, British Railways, London Midland Region, have been withdrawn to correct minor faults discovered on trials. Locomotives and multiple-unit sets delivered in advance for the start of the Crewe-Liverpool service will be used to replace them. It is reported that this is in no way similar to the difficulties experienced in Scotland, and is not a case of transformer trouble.

Delivery for trial running

The number of electric locomotives and multiple-units available for the Crewe-Manchester service is substantially more than required to operate the service. This is because additional locomotives and multiple-units have been delivered for trials in advance of the start of the Crewe-Liverpool line service.

The London Midland Region is taking advantage of the situation to correct minor faults discovered on trials and so ensure successful operation in the next phase when it begins.

Broken Delivery Promises

Sir William McFadzean, President of the F.B.I., on the need to supply goods by the promised delivery date

Sir William McFadzean, President of the Federation of British Industries, speaking about the export drive at a meeting of the F.B.I. Midland Regional Council last Tuesday, made an appeal to chairmen and managing directors and indeed everyone concerned throughout the country to play their full part in ensuring adherence to delivery promises. He said that there was one aspect of the export drive which gave serious concern. There had been a growing number of reports in recent months of broken delivery promises, i.e., failure to complete a contract on time or to supply goods ordered by an overseas customer by the promised delivery date. This was not, he said, a new problem, and Britain was not the only country falling down in this respect. Many similar complaints were heard of broken delivery promises by other countries, but the failures of others could never be an excuse for ourselves.

Reputation for early delivery

There were, he stated, many British companies which had an enviable reputation for getting jobs done and the goods delivered not only on time, but often in advance of the promised date. That was as it should be, but the trouble was that those companies which fall down on the job did harm not only to themselves but also to all other British exporters. Unfortunately, a reputation for late deliveries spread far more quickly and widely overseas than a reputation for contracts ably fulfilled to the letter.

The damage to the export drive caused by late deliveries needed no elaboration. If the product in question was, for example, a piece of machinery for a new factory overseas, its failure to arrive in time would hold up the start of production. If the products were in the consumer goods fields and were wanted for the Christmas shopping period and arrived too late, then their value to the overseas purchaser was largely lost. In almost every case, failure to supply on time would have cost the customer money, and he would not look favourably on purchasing British goods again.

Sir William McFadzean said that the causes of late deliveries were many and varied. Strikes and labour disputes could make punctual delivery impossible and do immense damage. Transport delays, or delays in handling at the docks, were yet another frequent cause of late deliveries, but the point he stressed was that although some of the causes were beyond the exporters' control, industry itself also carried a heavy responsibility. Moreover, the responsibility was not limited to that of the company which actually exported the finished product. It was also that of his suppliers and all those who provided services for industry in one form or another. The failure of any one of his suppliers, whether it be of raw materials, of components, or even of one single unit out of the hundreds or thousands which may go to make up a finished product could cause an exporter to fall down on his job. Anything, in fact, which upsets the flow from one company to another would almost certainly affect the delivery of the end product. The trouble may arise under several heads as, for example, lack of liaison between production and sales staff resulting in an order being accepted for delivery within an unreasonable time schedule; or pressure from one quarter or another to promise the impossible.

Apart from making every endeavour to adhere to delivery dates, Sir William McFadzean stressed another thing exporters could and should always do. Whenever late delivery for any reason became inevitable, the exporter should warn the customer and give him as full an explanation as possible of the reasons for the delay.

Everyone in industry was involved in this problem. It was emphatically not a matter for Government but one which industry must tackle for itself. He did not wish to suggest how individual companies should do this, but what was needed was a strong lead from the top. In full agreement with the Presidents of the Association of British Chambers of Commerce and the National Union of Manufacturers, the F.B.I. was therefore appealing to the chairman and managing directors of every firm in the country which was concerned in any way with export, whether directly or indirectly, to make it their personal business to see that their company's performance on deliveries should not be open to reproach. Only in this way could standards be raised right down the line, so that managers, staff and employees at all levels, including those on the shop floor, were made aware that to fall down on delivery was not only letting down their company, but also their country in its vital export drive.

Some people, he stated, may question the wisdom of bringing this matter out into the open with the consequent publicity it may receive. He felt confident that the overwhelming majority would agree with the F.B.I. action, for the knowledge that this problem was being realistically tackled would, he was sure, be appreciated by actual and potential customers overseas as yet a further positive sign of Britain's determination to capture and maintain its proper share of world trade.

Modernisation of Estoril electric railway

Re-equipment of the Estoril Electric Railway, the 16-mile line, electrified at 1,500 V. d.c., from Lisbon to Estoril, is making good progress. The main objects are faster and more frequent trains and improved amenities for a growing travelling public.

Re-signalling is in progress of the entire route between the termini at Cais do Sodré (Lisbon) and Cascais. The system embodies three-aspect automatic and semi-automatic colour-light signals with full axle-counting and track-circuiting. Work is to be completed by the end of April. Linked with this are the altered lay-outs at Algés and Oeiras, where the main down and up lines have been slewed to allow inter-position of a third track and construction of new platforms. This will enable fast to overtake stopping trains. At the height of the summer season, especially at week-ends, when beaches are frequented, it will be possible to terminate and reverse trains at both these stations.

Better braking and acceleration

A revised timetable is likely to come into force this summer. Instead of the present week-day service of 139 trains, some 240 will run daily between Lisbon and Cascais, with additional workings on Sundays and holidays. Although the speed limit of 56 m.p.h. will remain in force, widespread reductions in running-times are envisaged, largely as a result of the better braking and acceleration of the newest rolling-stock. The stainless-steel four-car multiple-unit trains constructed by SOREFAME to Budd design are now all in service, and the same firm is overhauling some of the older vehicles and equipping them with stainless-steel bodies. Introduction of the new timetable depends on the outcome of negotiations with the Government on revision of the fare structure and on substitution of two for three classes, so as to conform with other European railways.

Laying of long-welded rails and reinforced concrete sleepers is proceeding quickly. The engineers expect to reach Parede this year, São João do Estoril in 1962, and Cascais in 1963. At Cais do Sodré roofing of the platforms is well advanced. Further modernisation work at that terminus and in the adjoining maintenance shops is contemplated, as are roofing of platforms and replacement of existing structures at other stations.

In 1959 more than 21 million passengers were carried, exceeding the previous year's total by 6·4 per cent, which in itself was 6 per cent higher than that of 1957.

Government policy criticised

In a recent letter to the *Daily Telegraph* a correspondent points out that the Government greeted the Modernisation Plan as "courageous and imaginative," in 1955, although an official of the Treasury was not so complimentary. Since then there has been ample evidence of the introduction of new equipment and techniques and considerable progress in developing an organisation in keeping with modern industry than in the past. In view of the progress made he deplores the vacillation in carrying out the plan which has resulted in some large electrical firm's suffering heavily, some have lost key personnel and have had to meet increases in cost of equipment in some cases as much as 20 per cent.

Lack of stability at home, electrical firms have warned the Board of Trade, may mean a loss in sharing in overseas railway re-equipment, which could amount to as much as £200 million over the next five years. The dearth of orders for railway stock and equipment over the last six months is attributed to the perpetual reassessments of the plan by the Government, and their continual vacillation, after approval of a 15-

year modernisation plan is deprecated and compared to near lunacy.

It is time that the Government were made aware that only a thriving home market will guarantee a prosperous export market whatever the industry. It is of little use to restrict spending and retard the modernisation of the railways when so to do will have a deleterious effect, not only on the railway and the morale of its staff, but on industry as a whole.

Scottish Region griddle car

At Buchanan Street Station, Glasgow, on January 18, Mr. F. G. Hole, General Manager, British Transport Hotels & Catering Services Division, inspected the new griddle car which is in service on the Edinburgh-Inverness route. He was accompanied by Colonel D. H. Cameron of Lochiel, Chairman of the Scottish Area Board, British Transport Commission, and Mr. James Ness, General Manager, British Railways, Scottish Region, and members of the Area Board.

The latest development in refreshment car planning has been the introduction of the griddle car. It was realised after some years of working on the more traditional types of restaurant car that the catering tastes of the public were beginning to undergo a change, and that the future might lie in the field of griddle plate cooking.

Shell Mex & B.P. at Olympia

The evolution of the internal combustion engine is the theme of the display by Shell-Mex & B.P. Ltd. on the stand of Shell Industrial and Marine Lubricants at the Engineering, Marine, Welding & Nuclear Energy Exhibition at Olympia from April 20 to May 4, 1961. This theme has been adopted to mark the centenary of the conception by Otto in 1861 of the four-stroke cycle principle and to show the evolution of the engine through the ensuing 100 years.

The theme is developed in a mural with two sets of panels. The first set shows portraits of Lenoir, Otto, Robson, Akroyd Stuart, Diesel, and Büchi. These men discovered and successfully applied the principles which are the basis of the modern compression ignition engine and the panels contain extracts from the original patents dealing with their inventions and illustrations of the engines they built.

The second section of panels shows some of the applications of modern compression ignition engines in industry and transport by sea, road, and rail. This set of panels is illuminated and arranged to revolve.

The exhibit has been designed by Shell-Mex & B.P. Ltd. and a leaflet available at the stand contains a reproduction of the first set of panels, a brief history of the evolution of the compression ignition engine and of the parallel evolution of engine lubricants.

Diesels on Marylebone Suburban Services

From January 23, British Railways, London Midland Region diesel multiple-unit trains are working some of the suburban services from Marylebone Station. Weekdays the 8.50 a.m. to Aylesbury *via* the old Metropolitan and Great Central Joint line, the 2.42 p.m. and 6.30 p.m. to High Wycombe, and the 9.20 p.m. to Aylesbury *via* Princes Risborough are the down services involved. From High Wycombe the following up trains are formed from diesel stock : the 7.23 a.m., 5.10 p.m. and 8.10 p.m. to Marylebone. Additionally the 10.57 a.m. Aylesbury to Marylebone *via* Amersham is now a diesel working.

The 920-h.p. four-car sets built at Derby are used having provision for 332 seated passengers. The two power cars of each train are equipped with twin B.U.T. 230-b.h.p. horizontal diesel engines driving through fluid couplings and Wilson four-speed gearboxes on to the inner axle of each bogie.

The diesel engines, transmissions and controls have been supplied by British United Traction Limited whose equipment is of the same type used on the London Midland Region trains working the Liverpool-Manchester route. In addition, 10 Derby-built four-car sets with 230-h.p. B.U.T. traction units have been used over the past year on the St. Pancras-Bedford service.

The well-proved "900" Series B.U.T. diesels exclusively power the Swindon-built "Trans-Pennine" expresses which have reduced the through journey over the route from Hull to Liverpool by 45 min.

B.T.C. case for higher fares

A passenger who holds a monthly season ticket from Brighton to Victoria station, London, and uses it five days a week travels farther in a month than if he went to Istanbul, it was stated at a meeting of the Transport Tribunal in London yesterday. The tribunal was hearing two applications by the British Transport Commission for fares increases in the London area and for higher railway season ticket fares outside it.

Mr. E. Stewart Fay, Q.C., for the Commission, said that the present monthly season ticket from Brighton to Victoria was £9 4s. Assuming a five-day week, the traveller covered 2,244 miles in a month—102 miles a day on 22 days—a great distance for £9 4s.

"If that £9 4s. were invested in an ordinary British Railways return ticket, it would take him to Aberdeen and back, for which the return fare is £9 6s., but he would travel less than half the distance. Nor would he consume the same distance if he went to Istanbul, which from Victoria is 2,178½ miles; so he would have to go farther into Asia Minor, and a second-class fare from Victoria to Isbanbul is £21 7s."

Temporary order

The President of the tribunal is Sir Hubert Hull. One application is for permanent authorisation of the increases last May in London area fares and season ticket prices outside London under a temporary order. The other is to raise ceiling fares on road and rail services in the London area and season ticket fares outside London. The new ceiling, if approved, will embrace the increases which took effect on January 15 and will also allow further rises at a later date.

The increases not already introduced include 1d. on London Transport ordinary fares for three miles and upward. The 8d. fare will be kept for journeys between two and two-and-a-half miles.

The proposal is for season tickets on London Transport and London lines of British Railways to go up by another 5 per cent. Day return fares on London lines of British Railways would be raised to correspond to London Transport ordinary fares.

There were 15 objectors to the first application, and 41 to the second.

"£84-million deficit"

Mr. Fay said that in 1959, in the published figures, British Railways showed a deficit of £84 million, made up of a working deficit of £42 million, to which must be added another £42 million for central charges. In the supplementary estimates submitted to Parliament last year in respect of 1960 the deficit was estimated to have increased by £16 million.

It was easy to ascertain direct costs which were in fact being met by the passenger services but, of the indirect costs which now totalled £125 million for British Railways, the passenger services were estimated in 1958 to have contributed only £20 million. In 1959 it was somewhere between £25 million and £30 million, and in 1960 the position was unchanged.

He referred to the value of season tickets in the way of discount on ordinary fares. Monthly season tickets for 20 miles to the five-day-a-week traveller represented a 40 per cent discount, and something like 51 per cent on the six-day-a-week traveller. It was more on higher distances. "In any other line of country than the railways, it would be thought very generous."

Mr. Fay described the London Transport application as the core of the case, and said there was an application for a further increase here. "Since the 1959 scheme was before the tribunal there has been an increase in the wage bill of London Transport of £7 million.

If this application was granted in full, in a year in which it was in operation for the whole period—" and that certainly won't be 1961 "—there would be a £2,100,000 surplus.

The hearing was adjourned.

Staff & Labour Matters

L.T.E. pay increases

About 1,500 workers in London Transport staff canteens in garages, workshops, and on the Underground will get pay increases of 7s. and 11s. a week from Sunday, January 22.

Claims for shorter working week

At a meeting of the Railway Shopmen's National Council on January 19, the Employees' Side of the Council renewed its claim for the introduction of a 40-hr. week for railway workshop staff, i.e., a reduction of four hours in the working week.

In support of the claim, reference was made to the trend in industry generally toward the introduction of a shorter working week.

The Employers' Side of the Council undertook to examine the claim and to give a considered reply in due course.

The present standard working week in the outside engineering industry is 42-hr., having been reduced from 44 hr. on March 28, 1960.

A claim for a 40-hr. week for railway conciliation staff and a 38-hr. week for salaried staff has been submitted by the trade unions to the Railway Staff National Council, and will be considered by that body on February 17.

CONTRACTS & TENDERS

British Railways, Western Region, has placed a contract with Pelapone Limited for stand-by signalling power supplies for the Western Region line from Paddington to Reading. The equipment will consist of a completely automatic stand-by diesel alternator set, fuel supply system, electrical control gear, and distribution equipment. This will provide emergency power supplies for the signalboxes at Old Oak Common, West Drayton, Maidenhead and Reading East. Contracts are also in hand for Newport and Henley-on-Thames.

British Railways, Eastern Region, has placed the following contracts:—

Steels Engineering Products Limited: supply and delivery of one Coles "Aeneas Mobile" diesel-electric crane for central goods depot, Grimsby

Christy Bros. Ltd.: supply, delivery and erection of electrical installations at Billericay Station and goods shed at Wickford Station.

Wm. Wright & Son (Lincoln) Ltd: reconstruction of outside inspection pits, alterations to drainage, provision of new oil interceptor and pump house, erection of new oil interceptor and pump house, erection of new walkway and other works at diesel maintenance depot, Lincoln

Joseph Moss & Son Ltd.: construction of single-storey platform buildings and canopy on island platform and ancillary buildings to the west of the station at Colchester

J. Dixon (Doncaster) Limited: provision of staff accommodation at Moor Road, Wath Yard

R. H. Neal & Co. Ltd.: supply and delivery of five three-ton mobile cranes

A. & C. Barvis Limited: construction of reinforced concrete ramped approaches to footbridge No. 218 at Leigh-on-Sea.

The Export Services Branch, Board of Trade, has received calls for tenders as follow:—

From Queensland:

Construction of approximately 37 miles of line deviations exclusive of track construction in approximately 44 different locations spread over a distance of 336 miles between Hughenden and Mt. Isa on the Western Line of the Northern Division of the Queensland Government Railways.

The issuing authority is the Queensland Government Railways. Contract documents, comprising form of tender, conditions of tendering, agreement, general conditions, special conditions, specification and drawings, may be obtained by prospective tenderers on written request to Ford Bacon & Davis, Inc., Box 443F, G.P.O., Brisbane, Queensland, Australia. Tenders should be addressed to the Commissioner for Railways, Railways Building, Adelaide Street, Brisbane. The closing date is March 2, 1961. The Board of Trade reference is ESB/825/61. No further information is available at the Board of Trade.

From Uruguay:

12 railway wagons specially constructed for transport of portland cement in bulk, with accessories and spare parts

3 railway wagons specially constructed as above, with guard's cabin and mixed coupling system with accessories and spare parts.

The issuing authority is the Administracion Nacional de Combustibles Alcohol y Portland, Montevideo, to whom bids should be sent. The tender No. is 4458. The closing date is May 9, 1961. The Board of Trade reference is ESB/34073/60.

From Pakistan:

55 jack screws, lifting and traversing, 20-ton capacity.

The issuing authority is the Chief Controller of Stores, North Western Railway, Empress Road, Lahore, to whom bids should be sent. The tender No. is S-673/P6/6-60. The closing date is February 11, 1961. The Board of Trade reference is ESB/597/61.

10,500 hose pipe syphon (rubber), 24 in. x ¾ in. x ¾ in. "MBVG", to I.R.S. drawing No. VB-506, alt. (2) and to P.R.S. specification No. R-3-49

4,600 hose pipe syphon (rubber), 36 in. x ¾ in. x ¾ in. (C. & W.) "MBVG" to I.R.S. drawing No. VB-509, alt. (1) and to P.R.S. specification No. R-3-49

72,000 hose pipe (rubber), 27 in x 2 in., to N.W.R. drawing No. VG-251, alteration (nil) and to P.R.S. specification No. R-3-49

4,200 rolling ring (rubber), for 18 in. cylinder, to I.R.S. drawing No. VB-77, alt. (6) and to P.R.S. specification No. R-3-49.

The issuing authority is the Chief Controller of Stores, N.W. Railway, Empress Road, Lahore, to whom bids should be sent. The tender No. is 210-S/14 Part III (PIC) 60. The closing date was January 23, 1961. The Board of Trade reference is ESB/509/61. It is likely that an extension will be granted.

From the Philippines:

10 first class, air-conditioned passenger coaches as per specifications and drawings of the Manila Railroad Company. Tenderers must see the Mechanical Superintendent or the Operations Manager for further information.

The issuing authority is the General Manager, Manila Railroad Company, 943 Azcarraga, Manila, to whom bids should be sent. The tender No. is 40-60. The closing date is February 15, 1961. The Board of Trade reference is ESB/834/61.

From South Africa:

1 electrically-driven overhead conveyor system, together with overhead automatic storage lines, all to be installed in bays 40 and 41 of the coach repair shop, mechanical workshops, Koedoespoort. This conveyor will be used for the mechanical handling of coach loose material for spray painting purposes and, will be required to work in conjunction with two spray paint booths for which tenders will be called only after details of the conveyor system are known.

The issuing authority is the Stores Department, South African Railways. Bids in sealed envelopes, endorsed "Tender No. F.8501: Conveyor System," should be addressed to the Chairman of the Tender Board, P.O. Box 7784, Johannesburg. The closing date is February 17, 1961. Local representation is essential. The Board of Trade reference is ESB/908/61.

Further details relating to the above tenders together with photo-copies of tender documents, unless otherwise stated, can be obtained from the Branch (Lacon House, Theobald's Road, W.C.1).

NOTES AND NEWS

British Productivity Council address.—The British Productivity Council is now at Vintry House, Queen Street Place, London, E.C.4, tel.: Central 9613.

Southern Region trains diverted. Trains on the up line from Orpington, Kent, to Victoria, British Railways, Southern Region, were diverted on to the Catford loop on January 22, because of an earth slip between Kent House and Penge East.

German Federal Railway bond issue. Subscription lists will be opened from February 29 for a DM250 million (about £21·3 million) 6 per cent bond issue by the German Federal Railway, to be made at 99 per cent. The underwriting bank syndicate has agreed to a Bundesbank request that German residents have priority in the issue.

Brightside Engineering good order book. The current year is stated by the Chairman of Brightside Engineering Holdings Limited, Mr. Tom C. Firth, to have started with a good order book. He points out that manufacturing and selling costs are higher, and margins are lower, because of competition. Last year's record results, with profits increased by 26 per cent over 1959, were largely the result of the exceptional number of large contracts completed during the year. It is proposed to increase the dividend from 17½ to 20 per cent.

Overseas visitors in November. Overseas visitors to Britain in November, 1960, totalled 75,740, 18 per cent more than in November, 1959. The November figure brought the total number of arrivals in the first 11 months of 1960 to 1,584,865, an increase of 20 per cent on the same period in 1959.

Associated Engineering activities in Common Market area. Reference to the purchase by Associated Engineering Limited of companies manufacturing engine components in the European Common Market area is made by the Chairman, Mr. H. R. Moore, in his review of the past year. S.A.F. du Piston Borgo, in Italy, formed in January,

1960, has made good progress. Associated Engineering Limited has since acquired two concerns in France, the Société E. Demoulin, which specialises in cylinder liners and pistons for diesel engines, and S.A.F. du Piston Borgo. The Associated Engineering group profit for the year ended September 30, 1960, was £3,670,063 before tax, against £2,995,590 for the preceding year.

Silentbloc equipment on a.c. locomotive. In our issue of January 13, we described the 25kV. a.c. locomotive built by British Railways at Doncaster. The complete Alsthom suspension for these locomotives was supplied by Silentbloc Limited.

Responsibility for Glasgow train failures. Associated Electrical Industries Limited, the manufacturer of the defective transformers which are blamed for the failures to British Railways, Scottish Region, Glasgow suburban electric trains, is reported to have accepted Brigadier C. A. Langley's report on the incidents, and by implication, the blame. The company has drawn particular attention to the novelty of the electrification system.

L.T.E. bus in Switzerland. A London Transport Executive Routemaster bus will be seen on the Continent for the first time at the end of this month when one starts on a journey to Basle, where it will be one of the attractions of the British Weeks held from February 6 to February 18. It is being sent at the request of the British Council to assist in the promotion of the export drive.

Fleet Street Railway Circle Dinner. The Fleet Street Railway Circle held its annual dinner at the Great Western Royal Hotel on January 18, 1961. The illustration shows, left to right, Sir John Elliot, Chairman, Thos. Cook & Son Ltd.; Mr. H. C. Johnson, General Manager, British Railways, Eastern Region ; Mr. R. F. Hanks, Part-time Member, British Transport Commission ; Mr. F. D. M. Harding, Joint Managing Director, Pullman Car Co. Ltd.; Mr. K. W. C. Grand, Member, British Transport Commission ; Mr. H. L. Howarth, Managing Director, Westminster Press Provincial Newspapers Limited, and Mr. C. P. Hopkins, General Manager, British Railways, Southern Region.

Mailbag thieves imprisoned. Sentences ranging from 10 years to five years' imprisonment were passed at the Old Bailey on January 20 on four men found guilty of robbing mailbags on the Irish Mail travelling between Euston and Holyhead. All had been found guilty of stealing 24 registered postal packets on November 11.

Carriage-cleaning plant at Augsburg. In last week's issue it was stated that the Welwyn Tool Co. Ltd. is the United Kingdom representative for Kullen & Company, Reutlingen, Western Germany, supplier of the washing plant at the South Gosforth Carriage Sheds, Newcastle-upon-Tyne. Kullen & Company also supplied the carriage-cleaning plant for the German Federal Railway at Augsburg, described in our issue of December 30, 1960.

Additional N.E. Region train. British Railways, North Eastern Region, has announced that an additional diesel multiple-unit train has been put into service, leaving York each weekday at 8.19 p.m., calling at Thirsk 8.48 p.m., Northallerton 8.58 p.m., arriving Darlington at 9.18 p.m. This train provides a connection to Thirsk, Northallerton and Darlington off the 2.15 p.m. train from Bristol to York which arrives York at 7.49 p.m., and to Thirsk and Northallerton off the 4.50 p.m. (Mondays to Fridays) train from Kings Cross to Newcastle, which arrives York at 8.09 p.m.

Withdrawal of freight train service. The Eastern Region of British Railways has announced that from February 13, 1961, the freight train service will be withdrawn from Thorington Station, situated on the Colchester-Clacton branch line. This station will then be completely closed. Existing collection and delivery services for freight sundries will continue to operate in the area. Facilities for freight traffic in full wagon loads will be available at Great Bentley station.

Fox hounds electrocuted. Eight hounds were electrocuted when they followed a hare on to a railway line at Graveney, Kent, British Railways, Southern Region, last weekend. The 30 hounds with the Blean Beagles were in full cry after the hare, and the whole pack started to follow when it ran down to the line. The huntsman managed to stop 22 of the hounds before they reached the line.

" Starlight Special " trains. Scottish holidaymakers will again have " Starlight Specials " to London from Glasgow and Edinburgh this year. The first " Starlight Special " will run on Good Friday, March 31, and then each Friday from May 19 to September 8. The return fare of 90s. includes a reserved seat on both the outward and return journeys. Passengers return by " Starlight Special " on the Saturday week or Saturday fortnight after the date of departure.

Showroom on rails. Specially fitted to display Scottish souvenirs, toys, fancy goods, and costume jewellery manufactured by a Glasgow firm, the Scottish Region Travelling Showroom will tour Scotland, starting at Stranraer on Monday, January 23, for 10 weeks. From Stranraer and Dumfries to Aberdeen and Inverness, 22 cities and towns will be visited. The coach will be at Edinburgh, Princes Street Station, from Wednesday, February 15, to Friday, February 17, inclusive, and at Glasgow, Queen Street Station, on Thursday, March 30, and Friday, March 31. The firm concerned is S. Zederbaum Limited, which incorporates Tartancraft Scottish Souvenir Manufacturers.

Harwich-Hook of Holland advertising. British Railways, Eastern Region, has launched a publicity campaign calling attention to the

Group of guests at the Fleet Street Railway Circle annual dinner

advantages of using the night and day services to the Continent via Harwich and the Hook of Holland. Everetts Advertising Limited is staging this campaign which consists of press advertisements in selected national and London evening newspapers, with posters and poster cards *en suite* for display on British Railways and London Transport Executive hoardings and trains. The main theme is a photographic cut-out of the ss. *Amsterdam* in the form of a letter " H " with a focus title " the quiet ship from Harwich will sail tonight."

Clyde and Loch Lomond steamer services and trips. Many excursions and tours with trips on the Firth of Clyde and Loch Lomond by steamers of the Caledonian Steam Packet Co. Ltd., in association with British Railways, Scottish Region, are included in the programme for the summer season, from May 27 to September 25. Particulars of these and of motorcar ferry and other steamer services are obtainable from the General Manager, the Caledonian Steam Packet Co. Ltd., Gourock Station.

International Light Metals Conference. The fourth International Light Metals Conference to be held at Leoben, June 20-24, includes in Group 1, light construction, principles of light-metal construction, and examples of applications, the following papers: " Suburban passenger coaches constructed in aluminium," by Herr F. Drechsler, Donauwörth, " Some problems of light metal construction," by Mr. E. J. de Ridder, Richmond (U.S.A.), and " Experimental model and calculation of a self-supporting underground railway coach in light metal," by Dr. K. Sutter, Geneva.

Stewart and Lloyds higher costs. Despite increased efficiency and modernisation of plant, future profits of Stewart and Lloyds Limited will be affected by higher costs. Stating this, the Chairman, Mr. A. G. Stewart, pointed out that the full effects of the augmented costs have not yet been felt. There has been no major price change in group products since 1957. Outputs of iron, ingot steel, and rolled steel products were a record in the year ended October 1, 1960. The dividend is to be raised by 4 per cent to 15 per cent on a capital increased from £20 million to £27 million by a rights issue.

Leipzig Spring Fair attracts British firms. More British firms are exhibiting at the Leipzig Spring Fair, opening for 10 days on March 4, than at any time since 1954, the year this country resumed exhibiting there. Incomplete figures show that, this year, about 200 British exhibitors will occupy about 64,152 sq. ft., the largest foreign participation outside the Socialist bloc. They include: Lansing Bagnall Limited, Telegraph Construction & Maintenance Co. Ltd., Fairfield Shipbuilding & Engineering Co. Ltd., English Steel Corporation Limited, Tube Investments Limited, Steel Co. of Wales Ltd., John Summers Limited, Colvilles Limited, Marshall, Sons & Co. Ltd., Fords (Finsbury) Limited, Combined English Mills (Spinners) Limited, and Ransomes & Rapier Limited.

Greater expenditure on roads urged. If all the money promised in the White Paper was to be spent on the railways, there was an equally strong case for spending much more than at present on re-building the roads. This was stated by Mr. D. O. Good, a Vice-Chairman of the Road Haulage Association, at the annual dinner of the R.H.A. North Devon Sub-Area. If the railways were to be subsidised, he added, there should be steps to ensure that the subsidy was not used as a means to undercut the road hauliers. Now that the nationally-owned docks were to be supervised by a board under the direct supervision of the Minister of Transport, the Minister should see that the docks were modernised to cater for the greatly increased road traffic.

New " Trans-Pennine " diesel rail service passengers. Linking Hull-Leeds-Huddersfield-Manchester-Earlestown, and Liverpool by faster and more frequent trains, the new " Trans-Pennine " diesel rail service has evidently met the needs of many cross-country travellers. During its first week, January 2-8, over 13,000 people have used the new trains from Leeds, Hull and Huddersfield alone. The North Eastern Region of British Railways has announced that from Hull and Huddersfield the number of passengers on this route had increased by 30 per cent and from Leeds, the number had increased by 45 per cent.

A.E.C. African markets tour. Mr. John Ford, secretary of A.E.C. Limited, and Mr. A. V. Head, Deputy General Service Manager, left London by air on January 21 for an extensive tour of South and Central Africa. Their visit follows the big increase in sales in these territories during the past year, and the object of the tour is to expand service and general facilities already available to A.E.C. Limited vehicle operators.

Westward Television Limited exhibition train. A British Railways, Western Region, special train hauled by the historic locomotive *City of Truro* and including a reception and cinema coach, a fully-operational television studio coach, a generator van, and exhibition coaches rented by radio and television dealers, will visit 23 towns in the West Country during February. This mobile exhibition will be opened at Olympia Station, London, at noon on February 9 by Sir Bernard Waley-Cohen, Lord Mayor of London, and will be on show there for two days before departing, first for Truro. At each town visited there will be opening ceremonies. Celebrities will include Mr. Jack Train, who will act as official host throughout the tour.

British Standard for gear planing and shaping machines. The new British Standard, B.S. 3229: 1961, for gear planing and shaping machines establishes standards of accuracy for machines for cutting high-precision gears and for those for cutting general-purpose gears. A clause requires that test methods shall be those prescribed by the National Engineering Laboratory, East Kilbride, near Glasgow, or such others as may be agreed between the manufacturing and the inspecting authority. Test methods are not specified, but appendices indicate methods for verifying the alignment and concentricity of work spindle and cutter and for checking the uniformity of motion of the work spindle relative to the cutter. A summary of permissible errors is given, and also recommended methods for stress relief annealing of iron castings and welded parts and for heat treatment of lead screws. Copies may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1, price 12s. 6d.

Matterson cranes for new aluminium foundry. Construction of the new factory at Beverley, Yorks, for the Deans & Lightalloys Division of the Manganese Bronze & Brass Co. Ltd. is now virtually complete. Among the equipment chosen for this factory, 80,000 sq. ft. in area, and the largest aluminium foundry in the North, are several overhead cranes manufactured by Matterson Limited of Rochdale. The first of these, of five-ton capacity and 64 ft. span, is already in operation and the second will be delivered this month. The new Beverley factory is a part of the general reorganisation of the Manganese Bronze group which was recently announced. Plant for the manufacture of railway and marine doors and other aluminium cast components has been transferred gradually from the old Lightalloys Limited factory in Willesden, London, to

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Yorkshire by road and rail with only slight interruptions to production; this transfer will be complete, and the new foundry in full operation, by the end of February.

Dowty companies at Engineering, Marine, Welding, & Nuclear Energy Exhibition. Dowty Rotol Limited and Dowty Seals Limited will be represented at the Engineering, Marine, Welding, & Nuclear Energy Exhibition which opens at Olympia on April 20. The Industrial Division of Dowty Rotol Limited will exhibit a range of turbo-charging equipment for oil and petrol engines from 50-500 h.p. (normally aspirated). The Servo Division of that firm will be showing typical examples of Dowty-Moog electro-hydraulic flow-control servo-valves. Dowty Seals Limited are displaying seals, bondings, and mouldings in natural, synthetic, and silicone rubbers, and in Poly-Tetra-Fluoro-Ethylene (Fluon). Also exhibited will be seals, spats, and topats for simple roof and wall fixing, and sealing, for structures.

Railway Stock Market

The easing of hire-purchase restrictions and hopes that this might be followed soon by a reduction in bank rate from 5 per cent to 4½ per cent produced no big upswing in stock markets, though there were individual features of strength among leading industrial shares. It is recognised that the latest moves by the Chancellor of the Exchequer are not a sign that current difficulties are diminishing, but rather an indication that h.p. controls have been restricting home trade without bringing the hoped-for stimulus to export.

Where changed, foreign rails tended to improve in sympathy with the prevailing trend in stock markets, but very little business was reported. Antofagasta stocks were more active; the ordinary again changed hands around 16½, but the preference stock, which yields over 13¾ per cent, gained a point at 35¾.

Costa Rica ordinary stock eased from 37½ to 36½. Chilean Northern 5 per cent debentures eased from 53 to 52½, and Guayaquil & Quito assented bonds were marked down to 50½. Brazil Railway bonds were 4¾, and Paraguay Central prior debentures have been dealt in around 17.

Elsewhere, International of Central America common shares were $19½ and the preferred stock $100½. United of Havana second income stock remained at 6, Sao Paulo Railway 3s. units were 10½d. In other. directions, Mexican Central "A" bearer debentures strengthened to 58½.

Canadian Pacifics improved fractionally to $40¼, but the preference stock eased from 58½ to 58⅜, and the 4 per cent debentures from 60⅜ to 60. White Pass shares firmed up from $10 to $10½.

Nyasaland Railways shares were 9s. and the 3½ per cent debentures 35½. Midland Railway of Western Australia second mortgage debentures showed business at 25; the ordinary stock was 6½. West of India Portuguese capital stock was 110½.

There were a number of features among shares of locomotive builders and engineers. Beyer Peacock 5s. shares were good, having moved up from 6s. 1½d. to 7s. 1½d., after news of the company's latest deal. Gloucester Wagon 10s. shares, after a further advance, came back to 11s. 6d. after it was learned that no acceptable basis has been found for an amalgamation with Winget. A week ago Gloucester shares were 13s. 6d. Westinghouse Brake declined sharply from 41s. 7½d. to 38s. 3d., apparently because of some disappointment with the unchanged dividend G. D. Peters rose to 17s. 6d., compared with 15s. 7½d. a week ago, while North British Loco firmed up from 6s. to 6s. 6d. and Birmingham Wagon from 27s. 1½d. to 27s. 6d.

In electricals, A.E.I. receded on balance from 42s. 6d. to 41s. 3d. and G.E.C. from 32s. 4½d. to 31s. 9d., but English Electric at 33s. 9d. held the same price as a week ago. Crompton Parkinson 5s. shares strengthened to 12s. 3d. Reflecting the better trend of stock markets, Pressed Steel 5s. shares rose on balance from 26s. 3d. to 27s. 9d.

There were good features among machine tools, Alfred Herbert having risen from 55s. 3d. a week ago to 60s. 3d., Coventry Gauge 10s. shares from 23s. 10½d. to 24s. 4½d. and Craven Brothers 5s. shares from 9s. 10½d. to 10s. 3d. Dowty Group 10s. shares eased to 34s. 3d. Mather & Platt were firm at 43s., T. W. Ward steady at 64s. 6d., but Ruston & Hornsby eased from 27s. 3d. to 26s. 9d. Leyland Motors were 82s. 6d. xd., and Tube Investments 73s. 9d. Under the influence of the chairman's annual statement, more particularly the references to overseas business, British Oxygen 5s. shares strengthened to 27s. 3d.

Forthcoming Meetings

January 27-29 (*Fri.-Sun.*). Railway Students' Association, visit to Crewe-Manchester Electrification.

February 1 (*Wed.*). Peterborough Railway Discussion Group, at Peterborough Technical College, Eastfield Road, at 6.45 p.m. "Modernisation Progress in Eastern Region," Mr. H. R. Gomersall.

Feb. 1 (*Wed.*). Electric Railway Society, at the Fred Tallant Hall, 153, Drummond Street, N.W.1, at 7.15 p.m. " Mountains and Railways of Central Switzerland," Mr. J. G. Bruce.

February 1 (*Wed.*). The Institution of Electrical Engineers, Supply Section, at Savoy Place, London, W.C.2, at 5.30 p.m. " The Protection of High-Voltage Insulators from Power-Arc Damage," Dr. A. E. Guile.

February 1 (*Wed.*). The Contractors Mechanical Plant Engineers, Manchester & District Branch, at the Nags Head Hotel, Jacksons Row, Manchester, 2, at 7.30 p.m. Film on excavators and excavation.

February 2 (*Thu.*). British Railways, London Midland Region, Lecture & Debating Society, and Railway Students' Association at Paddington, at 5.45 p.m. Debate: " That there is a wasteful use of national resources in the field of long distance freight traffic."

February 2 (*Thu.*). The Institution of Electrical Engineers, at Savoy Place, London, W.C.2, at 5.30 p.m. " Silicon Power Rectifiers," Mr. A. J. Blundell, Mr. A. E. Garside, Mr. R. G. Hibberd, and Mr. I. Williams.

February 3 (*Fri.*). The Railway & Canal Historical Society, East Midlands Group, at the Community House, Derby Road, Long Eaton, at 6.45 p.m. "The Caledonian Railway," Dr. Stillet.

February 3 (*Fri.*). The Institute of Electrical Engineers, Medical Electronics Discussion Group, at Savoy Place, London, W.C.2, at 6 p.m. Discussion: " Recent Technical Developments in Eye Movement Recording," Opened by Dr. P. A. Merton and Dr. C. Rashbass.

February 4 (*Sat.*). The Railway & Canal Historical Society, North Western Group, at the Oddfellow's Institute, Chestergate, Stockport, at 6.30 p.m. " The Remarkable History of the Lancaster & Preston Junction Railway," Mr. M. D. Greville.

February 6 (*Mon.*). The Institute of Transport, Metropolitan Section, at 80 Portland Place, W.1, at 5.30 p.m. " The Work of the Design Panel of the British Transport Commission," Mr. C. Barman.

February 6 (*Mon.*). The Permanent Way Institution, London Section, at 222, Marylebone Road, N.W.1, at 6.30 p.m. Presidential Address " Permanent Way: Its recent history and future prospects."

February 7 (*Tue.*). The Institute of Transport, at the Connaught Rooms, Great Queen Street, W.C.2, at 12.15 p.m. Informal luncheon.

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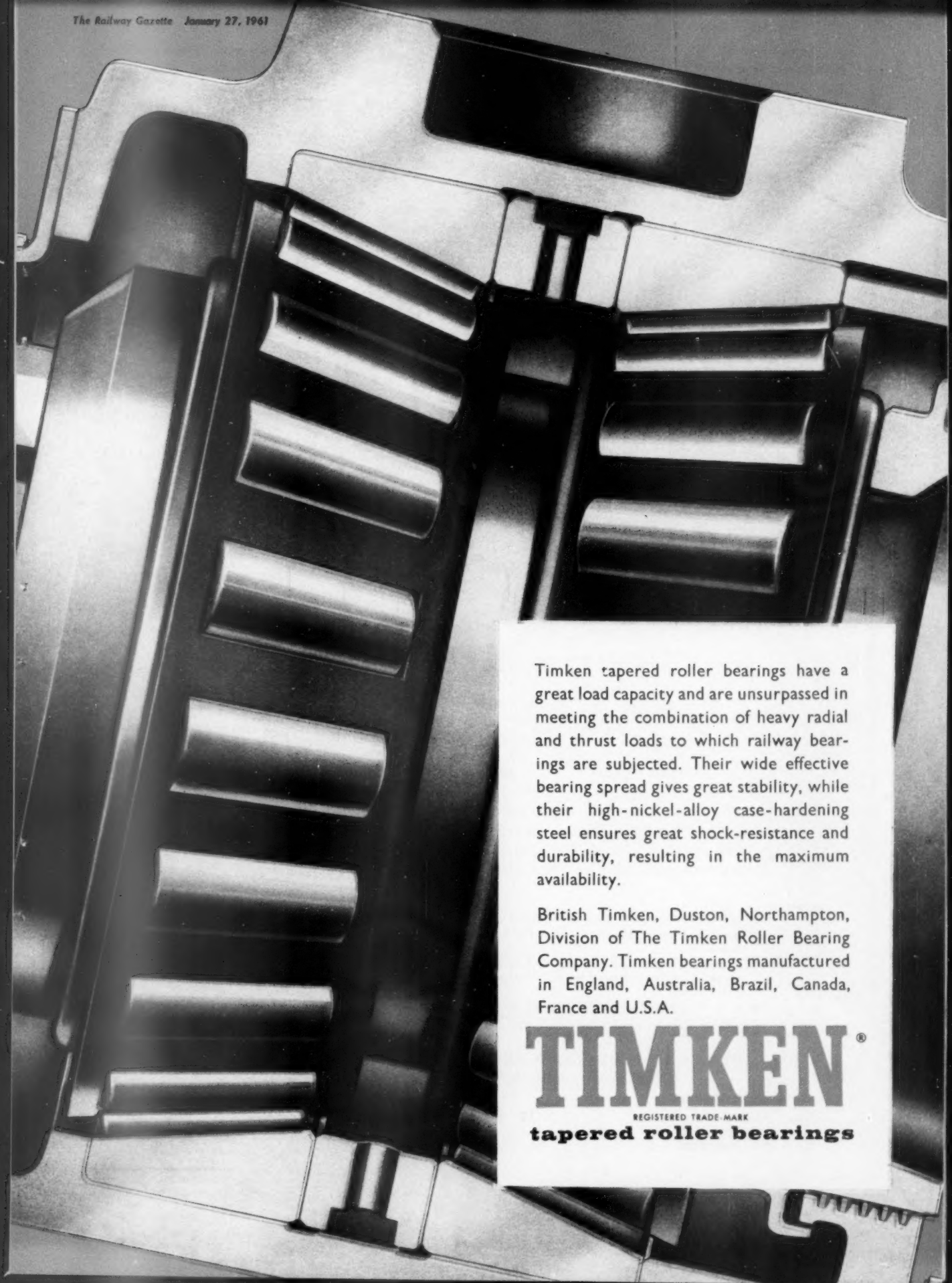

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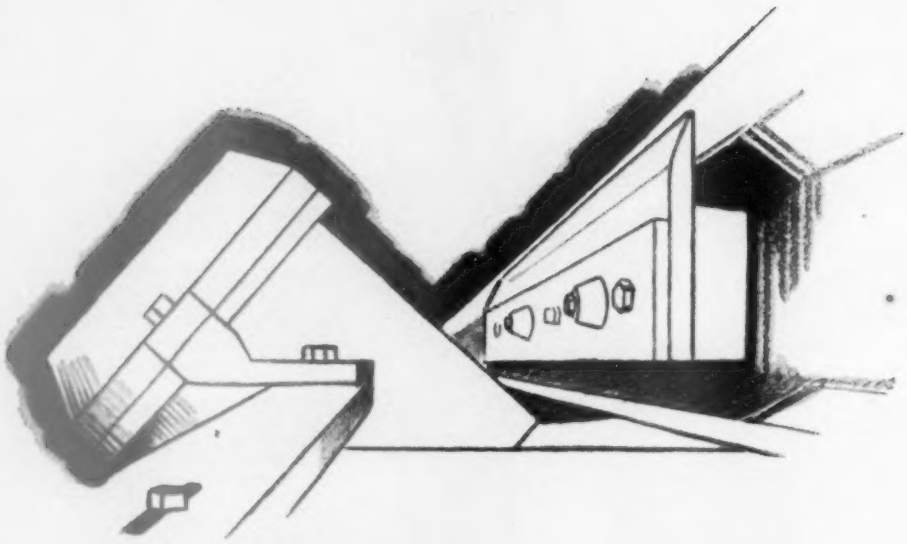

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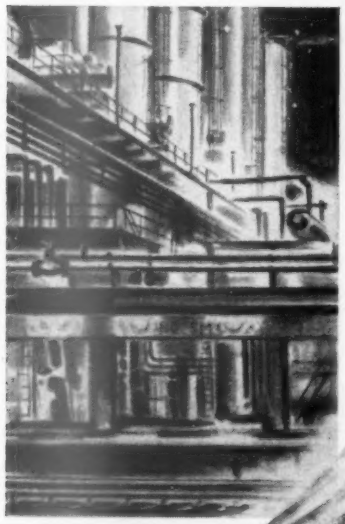

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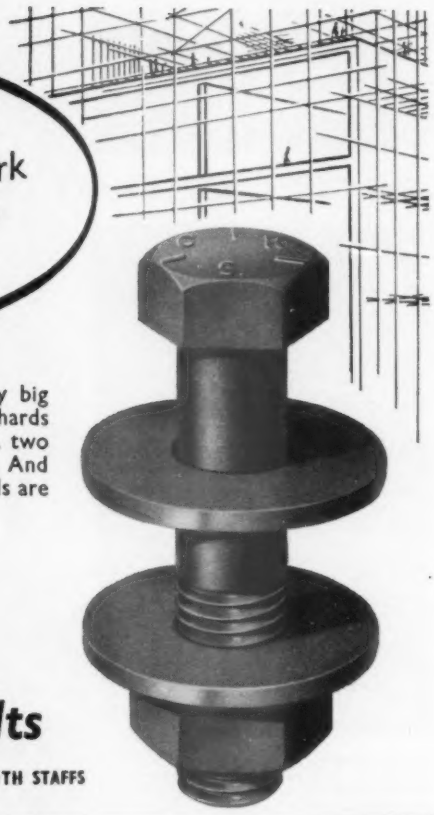

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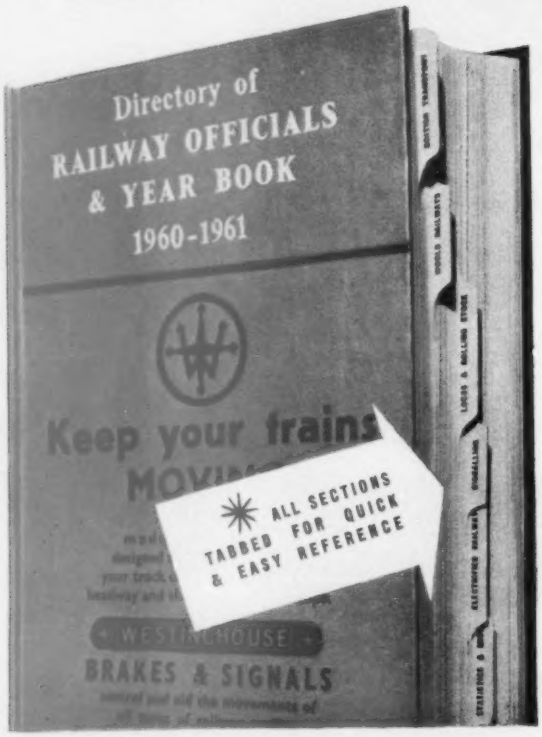

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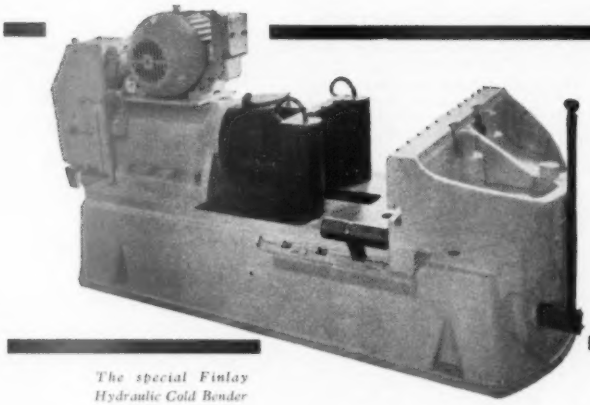

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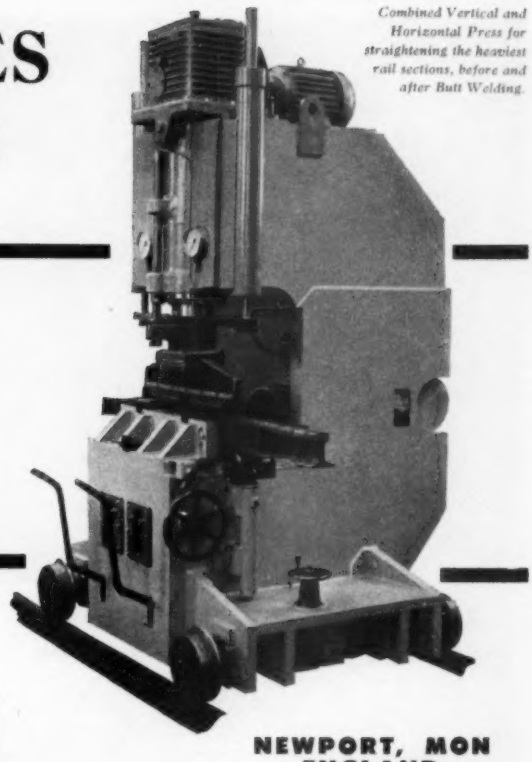

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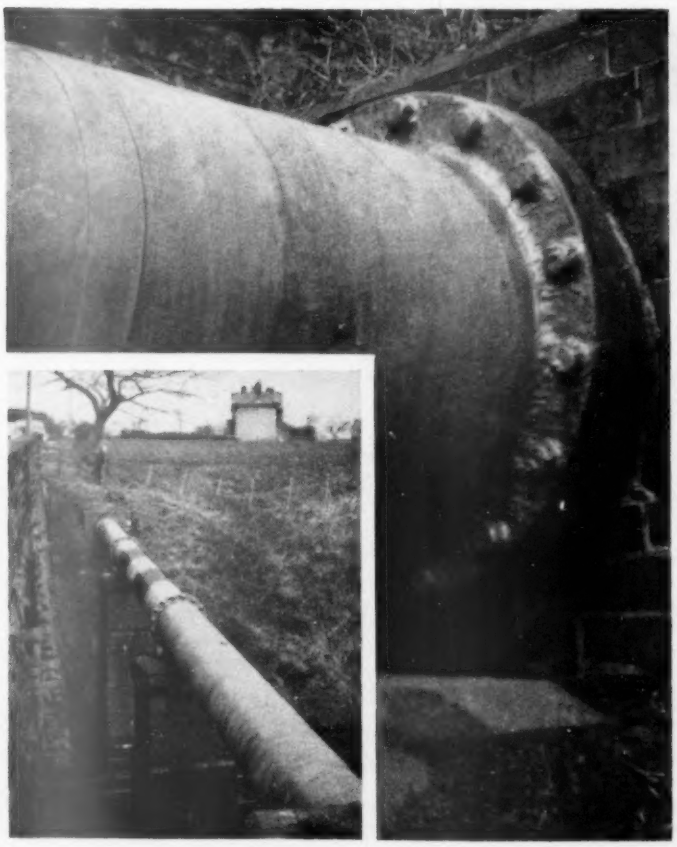

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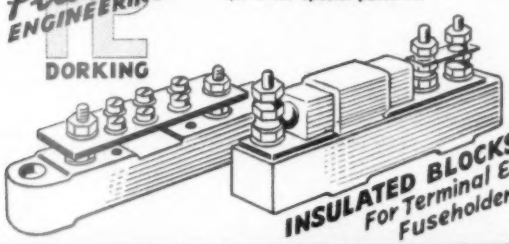

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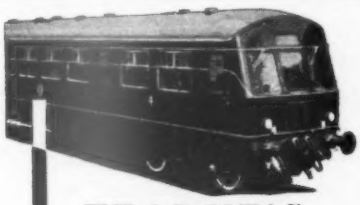

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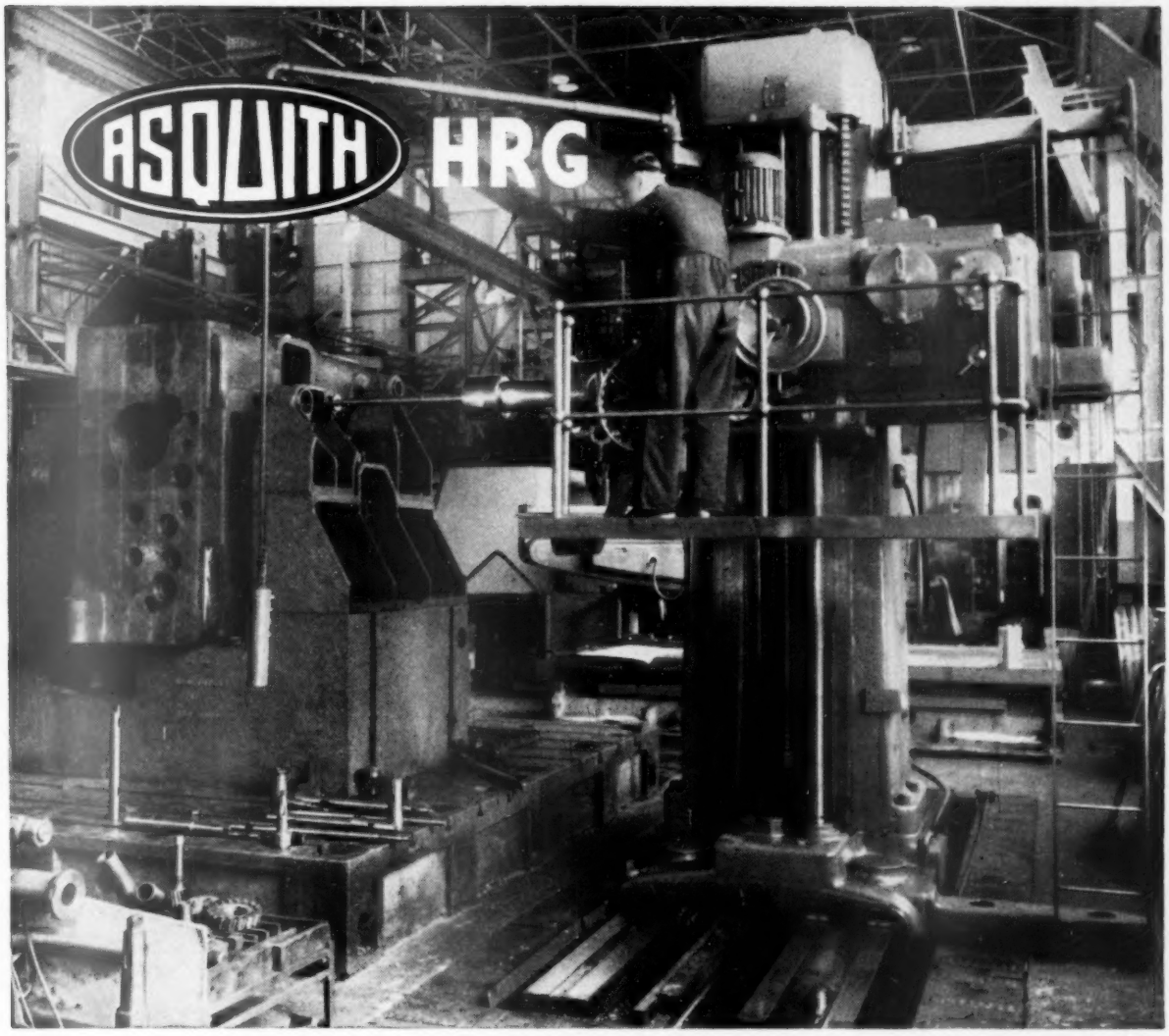

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